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DEPARTMENT OF THE INTERIOR  
BUREAU OF MINES

JOSEPH A. HOLMES, DIRECTOR

GOVERNMENT COAL PURCHASES  
UNDER SPECIFICATIONS

WITH ANALYSES FOR THE FISCAL YEAR 1909-10

BY

GEORGE S. POPE

WITH A CHAPTER ON

THE FUEL-INSPECTION LABORATORY OF THE BUREAU OF MINES

BY

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# GOVERNMENT COAL PURCHASES UNDER SPECIFICATIONS, WITH ANALYSES FOR THE FISCAL YEAR 1909-10.

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By GEORGE S. POPE.

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## INTRODUCTION.

This bulletin is the fourth of a series <sup>a</sup> showing the results of the purchase of coal by the Government under specifications. The work of inspecting and analyzing coal delivered on Government contracts was transferred to the Bureau of Mines by an act of Congress effective July 1, 1910. It had been carried on for several years before that date by the technologic branch of the United States Geological Survey.

The purchase of coal on the dealer's statement as to quality or on the reputation of the mine or district producing the coal is gradually being discontinued. At present most coal-purchasing contracts make definite provision regarding the desired heating value of a coal and the composition as shown by analysis. The heating value is usually expressed in British thermal units<sup>b</sup> and the composition specified is that shown by proximate<sup>c</sup> analysis. The price to be paid for delivered coal is made to depend on whether the analyses and heating-value tests of samples representing the delivery show the quality to be above or below the quality set forth in the contract.

Large coal consumers are beginning to appreciate more and more the importance of the cost of power as a factor in the cost of producing a finished article. The endeavor to increase the efficiency and the economical operation of a power plant calls for an intimate knowledge of the quality of the coal being used. The purchase of coal under specifications insures the purchaser getting what he pays for and the coal being of the quality guaranteed. In addition, the analyses and tests of the delivered coal furnish data whereby the power-plant results can be comprehensively studied and a continuous check maintained on the conditions of operation.

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<sup>a</sup> Randall, D. T., The purchase of coal under Government and commercial specifications on the basis of its heating value, with analyses of coal delivered under Government contracts: U. S. Geol. Survey Bull. 339, 1908, 27 pp. Burrows, J. S., Results of purchasing coal under Government specifications: U. S. Geol. Survey Bull. 378, 1909, 44 pp. Pope, George S., The purchase of coal by the Government under specifications, with analyses of coal delivered for the fiscal year 1908-9, 80 pp.: Bull. 11, Bureau of Mines (reprint of U. S. Geol. Survey Bull. 428).

<sup>b</sup> See page 85.

<sup>c</sup> See page 74.

The replies to a circular letter sent to the mayor of every city of over 100,000 population in the United States brought out the fact that about 55 per cent of the cities replying purchase coal under specifications, many of which are similar to those used by the Government. A great many industrial concerns are likewise purchasing coal under specifications. The numerous requests received by the Bureau of Mines for authentic information concerning purchases of coal under specifications, or according to its heating value, attest the growing interest in the subject.

The purchase of coal on a specifications basis is an important step toward the conservation of the mineral resources of the nation, for it results in the increased use of the lower grades of coal. The poorer grades find a market by competing with the better grades, not as to the price per ton, but as to the cost of an equal number of heat units.

The purpose of this paper is to explain in general terms the methods that the Government has found most satisfactory for the purchase of a large part of its coal supply, including the consideration of bids, the awarding of contracts, and the analyzing of samples <sup>a</sup> on which the price corrections are based.

In this report, for the information of prospective bidders on Government contracts, a list of the coal contracts in force during the fiscal year ended June 30, 1911, is furnished. General averages of the analyses during the fiscal years 1908 to 1910, inclusive, are tabulated for the various sizes of anthracite and also for the several kinds of bituminous coal purchased for Government use, and the results for the fiscal year ended June 30, 1910, are shown in detail by months. It is hoped that this information will be of value to both coal dealers and coal consumers.

#### PERSONNEL.

The work reported in this bulletin was done under the general supervision of J. A. Holmes, formerly expert in charge of the technologic branch of the United States Geological Survey and now Director of the Bureau of Mines. The duty of ascertaining the quality of coal delivered under specifications was assigned to the fuel-inspection section, with the writer in charge. The collection of samples was in charge of P. M. Riefkin, assisted by the following men: N. H. Snyder, W. J. Harris, jr., H. H. McKee, A. A. Straub, Leo Loeb, and E. W. Miller. S. S. Voorhees was chemist in charge of the laboratory, with the following assistants; J. D. Davis, W. J. Buttner, H. M. Cooper, J. H. Sherrer, Wood Freeman, H. C. Elledge, J. S. McCune, and Wallace Alexander. J. W. Peters was expert computer.

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<sup>a</sup> For a discussion of methods of taking and preparing samples of coal deliveries, see Technical Paper 15, Bureau of Mines: Sampling coal deliveries, with specifications for coal purchases, by George S. Pope, 1912.

**VALUE OF COAL AS FUEL.****GENERAL STATEMENT.**

Coal is now burned for power production in gas producers and in boiler furnaces. For coals and lignites high in moisture or high in ash, the gas producer, used in connection with a gas engine, is best adapted to develop power, but for the generation of steam, which can be used for heating as well as for power, coal may be more conveniently burned in a specially constructed furnace under a boiler.

Coal is burned under boilers for producing power, for drying various materials, or for warming buildings. The most valuable coal, therefore, is that which gives up the most heat to the boiler for a given weight burned.

The value of a coal is indicated by the number of heat units it contains. This heating value is expressed in terms of British thermal units (abbreviated B. t. u.) per pound of coal, and is determined by means of a special apparatus called a calorimeter.<sup>a</sup>

In purchasing coal for any power plant the aim should be to obtain a fuel which, all things considered (such as equipment, price of coal, and cost of labor and repairs), will produce a horsepower for the least cost. Experiments seem to indicate that almost any fuel may be burned with reasonable efficiency in a properly designed apparatus. The recognized requirements are as follows: (1) A uniform and continuous supply of fuel to the furnace; (2) an air supply slightly in excess of the theoretical amount required for complete combustion; (3) a temperature sufficiently high to ignite the gases that are driven off from the fuel; (4) a complete mixture of these gases with the air supplied before they reach a cooling surface, such as the shell or tubes of a boiler.

Some of the factors that may influence the commercial results obtained in a boiler are cost of the coal as determined by price and heating value, care in firing, design of the furnace and boiler setting, size of grate, formation of excessive amounts of clinker and ash, available draft, and size of the coal.

**FACTORS AFFECTING VALUE.****MOISTURE.**

Coal as mined contains more or less moisture. It is exposed to the air in shipment and may either dry out or be drenched by rain. The moisture in the coal delivered is worthless to the purchaser and really costs him a considerable amount in freight and cartage and in the loss of the heat required for its evaporation in the furnace. If all coal contained the same proportion of moisture, or if the proportion

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<sup>a</sup> See p. 86.

of moisture in coal delivered by a given dealer were constant, the purchaser's problem, so far as this factor is concerned, would be simplified.

Under present conditions the moisture is an important element in the valuation of a ton of coal. The heating value of delivered coal may be based on the British thermal units resulting from an analysis of the coal "as received," or of "dry coal" in conjunction with the percentage of moisture. The "dry-coal" results are convenient for comparing several coals to determine the relation of each element to the others; this report is important because the moisture in the same coal varies from day to day. The "dry-coal" report is also convenient for comparing the performance of boilers burning the same or similar coals. Of several coals having a similar composition, the one that has the least moisture and the least ash will generate the most steam when burned under a boiler.

#### ASH.

Earthy matter and other impurities that will not burn are classed as ash. In commercial coals the proportion of ash may range from 3 to 25 per cent. Coals containing small percentages of ash are the most valuable, not only because of their correspondingly higher heating capacity, but because they offer less resistance to the free and uniform distribution of air through the bed of coal in the furnace. The labor and cost of managing the fires and of handling the ashes are also correspondingly less and are items to be considered in the choice of a coal. With the ordinary furnace equipment there may be a considerable loss of efficiency and capacity through a large percentage of ash, and as the ash increases there will usually be a decided drop in both efficiency and capacity. The ash content may be increased to such a proportion that the coal will generate no steam, and then the efficiency and capacity of the plant will be zero. Such coal is of course, worthless as boiler fuel, and the cost of handling it is a direct loss. However, coals so high in ash that they are unsuited to boiler furnaces can be utilized in gas producers.

#### VOLATILE MATTER <sup>a</sup> AND FIXED CARBON.

The volatile part of some coals, shown in the analyses, may be chiefly combustible, but it generally contains some inert matter. The proportion of this differs in different coals, and therefore the heating value of any coal can not be determined from its proximate analysis alone. Moreover, different coals that contain the same proportion of volatile matter do not behave alike in the furnace. In order to determine the comparative value of two coals for the same

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<sup>a</sup> See Bull. 1, Bureau of Mines: The volatile matter of coal, by H. C. Porter and F. K. Ovitz, 1910, 56 pp., 1 pl.

purpose it is important to know both the chemical composition and the British thermal units.

Of two coals of different character, the one that contains the higher proportion of fixed carbon is most easily burned so as to give the maximum efficiency. However, if the coal containing the higher volatile matter is properly burned in a suitably designed furnace it may be made equally efficient.

#### SULPHUR AND CLINKER.

Sulphur may be present in the free state but more commonly is in combination with iron or other elements. The formation of clinker has long been attributed to the sulphur, but recent investigations point to the fact that sulphur alone is not the cause; in fact, it is possible to burn coal containing up to 5 per cent sulphur without difficulty. The proportions of iron, sulphur, lime, and silica in the ash, the method of firing the coal, and the rate of combustion are responsible for clinkering. The exact relation of clinkering to the constituents of the ash is not known well enough to enable a chemist to predict from the analysis of the ash that the coal will clinker. Frequently, clinkering is caused by the fireman slicing the fire too often and working the ash up from the grates into the hot coal bed, where it melts and fuses into heavy dense masses. At rapid rates of combustion the ash in a given coal may clinker (though at lower rates it would not), because at rapid rates the temperature of the ash may be raised to the fusing point. E. G. Bailey<sup>a</sup> by a recent study of the fusing temperature of ash has contributed valuable information on clinkering. There is need of further investigation, however, to determine the effect of sulphur and the other elements in the coal on the formation of clinker in furnace fires during combustion.

Difficulty from clinkering may be relieved somewhat by introducing a little steam under the grates, though for coals very low in ash, this method sometimes proves insufficient. With such coals, crushed limestone spread over the thin fire bed as soon as clinkering begins may prevent the clinkers from adhering to the grates.<sup>b</sup>

#### SIZE OF COAL.

The size of the coal influences the capacity of any given equipment, owing to its effect on the draft. With a poor draft fine coal can not be burned in sufficient quantities to maintain the rated capacity. If thin fires are resorted to, the efficiency is usually lowered as a

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<sup>a</sup> Bailey, E. G., and Calkins, W. B., Clinkers and the fusing temperature of coal ash: Bull. No. 3 of the Fuel Testing Company, 1910, 12 pp.

<sup>b</sup> Breckenridge, L. P., A study of four hundred steaming tests, made at the fuel-testing plant, St. Louis, Mo., in 1904, 1905, and 1906: U. S. Geol. Survey Bull. 325, 1907, p. 39.

result of an excessive supply of air through holes in the fire. As a rule, when dust and very fine coal are fed into the furnace they either check the flow of air or are taken up by the draft and after being only partly burned are deposited back of the bridge wall; or they may pass up the stack, to the annoyance of people in the vicinity of the plant. If this dust is completely burned in passing through the furnace there is of course no loss of fuel. Coal of uniform size forms the most satisfactory fuel, as it does not pack so closely as coal of different sizes mixed.

In general it may be said that in any market the coal obtainable at the lowest price is the most economical, provided the furnace equipment is suitable. If the furnace is not so designed as to permit the use of the cheaper coal the desirability of changing it should be investigated.

#### HEAT UNITS.

Tests tend to show that, other conditions being equal, coals of similar composition are of value in proportion to the British thermal units, and the determination of these units in any coal indicates approximately its value. It should be remembered, however, that the value of a coal for any particular plant is affected by the character of the furnace, for all furnaces are not equally suitable for burning the same grade of coal. Aside from this factor, coals may be compared in terms of the British thermal units obtained for 1 cent, or on the basis of the cost of a million heat units.

#### SUMMARY.

In the purchase of coal, then, attention should be given to the character of the furnace equipment and the load, the character of coal best suited to the plant conditions, the number of heat units obtainable for a unit price, the cost of handling the coal and ash, and the possibility of burning the coal without smoke or other objectionable features.

#### **ADVANTAGES OF DEFINITE SPECIFICATIONS FOR COAL PURCHASES.**

##### **DEFECTS OF THE OLD PLAN.**

Under the old plan of purchasing coal, when the consumer had cause or thought he had cause to find fault with the quality of the fuel he received, he was assured that it must be good because, like all the other coal sent him, it came from a mine with an established reputation. Such a state of affairs made it difficult to take advantage of the competition which usually results from a considerable number of bidders being asked to submit prices. The purchaser was afraid to



buy from any dealers but those he knew and trusted, because, although each dealer claimed that his coal was equal in quality to that of the others, yet if it did not prove to be satisfactory there was no standard for settlement or for cancellation of the contract. Many thousands of dollars worth of coal is still bought each year in this manner, yet a buyer or investor would consider it absurd to make a contract for a building with no specifications other than that it should be of a certain size and well constructed. Neither would he buy gold, silver, or even copper or iron ores on the mere information that they were mined at certain localities. All such products are now purchased to a great extent according to their value as shown by chemical analysis. This is true of coal in only a small degree, but the number of coal contracts made on such a basis is increasing every year.

A contract for purchase of coal under specifications is as advantageous as a definite understanding regarding the quality and other features of any other product, or of a building operation or engineering project. The man who buys under specifications gets what he pays for and pays for what he gets.

#### STANDARD OF QUALITY.

When the bidder is allowed to specify the quality of the coal he proposes to furnish, as determined by chemical analysis, he is placed on a strictly competitive basis with other bidders. Such a procedure broadens the field for both the bidder and the purchaser. It makes the bidder's proposal, when accepted, a contract that specifies an established standard of quality. This furnishes a basis for settling disputes regarding the quality of the coal delivered and the price to be paid if the fuel is either better or poorer than has been guaranteed. If other coal must be substituted, as often happens, there is a standard for settlement. If the coal is uniformly poorer than the standard as specified there is a basis for the cancellation of the contract.

The quality of coal from a given mine may vary from time to time through the failure of the miners to reject impurities; or the physical and chemical character of the coal of a certain bed may vary from place to place. In some coal fields different beds of coal are mined at the same time and the output is mixed. When there is need of preparation, as by picking slate and other impurities, or by jigging or washing, the quality or value of the coal marketed depends a great deal on the care taken in the processes employed. The mining companies are responsible in a large measure for variations in the grade of prepared coal. The purchase of coal under a contract that distinctly specifies its quality stimulates the operator to prepare coal better before shipping it to market. Examples of fluctuation in qual-

ity are furnished by the table on pages 37 to 73, which show variations both in ash and in British thermal units of coal delivered.

#### NATURE OF SPECIFICATIONS.

Government specifications are drawn with a view to the consideration of price and quality. For manufactured articles and materials of constant and uniform quality they generally can be reduced to a clear and simple statement of what is desired, but for coal, which may be considered a finished product when loaded on the railroad cars at the mine, the great and obscure variation in character makes a simple requirement impracticable, and this fact is recognized and provided for in the coal specifications prepared by the Bureau of Mines. Under these specifications bidders on most of the contracts for anthracite <sup>a</sup> are requested to quote prices on the various sizes, a definite standard of quality being specified for each size; bidders are also requested to state the standard of quality and price for bituminous coal, and for those anthracite coals purchased under the double standard. <sup>b</sup> Awards are then made to the lowest responsible bidder for anthracite and to the bidder offering the best bituminous coal for the lowest price, the amount finally paid being determined by the tests made under the terms of the specifications. The specifications become part of the contract, and payment for coal delivered is made according to the standard of quality fixed. The actual quality and value of coal delivered is determined by analysis and test of representative samples taken in a specified manner by agents of the Government and analyzed in the Government fuel-testing laboratory at Washington. For coal of better quality than the standard the contractor is paid a bonus proportional to its excess of value. For coal of poorer quality than the standard, a deduction is made from the contract price proportional to the deficiency in value.

It evidently will not be satisfactory to either the buyer or the seller to establish a standard for the coal unless the liability to variation is recognized and provision is made for settlement when the coal is better or poorer than the standard. Experience with any method of buying coal shows that coal will seldom be rejected when of poor quality, because of the difficulty, delay, and cost of removing it from the bins. The buyer is often confronted with the alternative of burning the coal delivered or of going without fuel until more can be procured. Unless the coal is very bad it is usually expedient to use it and pay a smaller price. This is also more favorable to the contractor, as to remove the coal would be costly and the coal might not be satisfactory to any other customer.

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<sup>a</sup> See page 19.

<sup>b</sup> See page 18.

**SUMMARY OF ADVANTAGES.**

The advantages of purchasing coal under specifications may be briefly summarized as follows:

(1) Bidders are placed on a strictly competitive basis as regards quality as well as price. This simplifies the selection of the most desirable bid and minimizes controversy and criticism in making awards.

(2) The field for both the Government and the dealers is broadened, as trade names are ignored and comparatively unknown coals offered by responsible bidders may be accepted without detriment to the Government.

(3) The Government is insured against the delivery of poor and dirty coal, and is saved from disputes arising from condemnation based on the usual visual inspection.

(4) Experience with the old form of Government contract shows that it is not always expedient to reject poor coal, because of the difficulty, delay, and cost of removal. Under the present system rejectable coal may be accepted at a greatly reduced price.

(5) A definite basis for the cancellation of the contract is provided.

(6) The constant inspection and analysis of the coal delivered furnishes a check on the practical results obtained in burning the coal.

(7) Being paid for on the quality basis incites the contractor to prepare the coal more carefully.

**THE GOVERNMENT AS A COAL PURCHASER.****EXTENT OF GOVERNMENT PURCHASES.**

The United States Government purchases annually from \$6,500,000 to \$8,000,000 worth of fuel. This sum includes the cost of delivery and of stowage. Each department buys coal through its purchasing officers. The Navy, War, Treasury, Interior, and Commerce and Labor Departments are large consumers of coal. Much of the coal used by the Government must be delivered by wagon, and the business is therefore limited to dealers having hauling facilities. This is especially the case in the city of Washington, where coal is purchased principally for heating the public buildings.

The Treasury Department is a large consumer of coal delivered in wagons. The fuel required for post offices, customhouses, United States courthouses, marine hospitals, mints, and other Federal buildings throughout the country is purchased by this department, which also buys for the Revenue-Cutter Service.

The Navy Department is a large car-lot consumer, as well as a purchaser of large cargoes of coal for foreign delivery. The Bureau of Supplies and Accounts of this department purchases the cargo lots for the ships of the Navy and the car lots for use in the navy yards.

The War Department makes purchases of coal for the many forts and army posts in the United States and foreign possessions and for the ships in the Army transport service. The principal car-lot consumers are the Ordnance Department, which buys coal for the arsenals, and the Engineer Corps, which buys fuel for use in river and harbor improvement and other construction work.

Coal for use in the Canal Zone, Isthmus of Panama, is purchased by the Panama Railway Co. of New York, f. o. b. at an Atlantic port in the United States. At present the coal is shipped from Norfolk, Va., and Newport News, Va.

The Department of Commerce and Labor purchases coal for the vessels of the Coast and Geodetic Survey, for the Bureau of Lighthouses, and for the Immigration Service. The Bureau of Fisheries is a consumer of anthracite and bituminous coal in small lots, delivered to the cars of the bureau and to its stations throughout the country.

The Interior Department is a large consumer of coal in Washington, where it purchases annually 20,000 tons of bituminous coal and 1,000 tons of anthracite for the Government Hospital for the Insane. Outside of Washington this department's most important contracts are those for coal to be delivered to Indian schools and agencies.

Most of the coal purchased by the Government is used for warming public buildings and for generating power, though small quantities of blacksmith's or forge coal and of coke are bought. The larger individual contracts are those for bituminous coal and the small sizes of anthracite. The domestic sizes of anthracite are, as a rule, purchased in small lots and delivered mainly by wagons.

#### **GROWTH OF THE SPECIFICATION BASIS FOR CONTRACTS.**

For the fiscal year 1908-9 the United States Geological Survey was called upon to make tests and analyses representing 611,400 tons of coal bought under contract at an estimated cost of \$1,858,800; for the fiscal year 1909-10, 829,300 tons, at an estimated cost of \$2,286,800, was tested and analyzed; for the fiscal year 1910-11 the Bureau of Mines made analyses covering 1,091,400 tons, representing an estimated cost of \$3,084,800; and during the fiscal year 1911-12 it is estimated that the bureau will make analyses covering 1,500,000 tons, representing an expenditure of \$4,750,000.

A few Government stations have their own laboratories for analyzing and testing coal delivered under specifications. The number of tons and the expenditures covered by these contracts would somewhat increase the quantities and values above given.

**SUMMARY OF GOVERNMENT COAL CONTRACTS FOR THE FISCAL YEAR 1910-11.**

The contracts for the fiscal year 1910-11 are summarized according to departments in Table 1:

TABLE 1.—Government purchases of coal under contract<sup>a</sup> during the fiscal year 1910-11.

Kind and size of coal.	Coal for use in District of Columbia, all departments.		Coal for use outside the District of Columbia.					
			Department of Commerce and Labor.		Indian Service.		National Home for Disabled Volunteer Soldiers.	
	<i>Tons.</i>	<i>Cost.</i>	<i>Tons.</i>	<i>Cost.</i>	<i>Tons.</i>	<i>Cost.</i>	<i>Tons.</i>	<i>Cost.</i>
Anthracite:								
Broken.....	9,225	\$51,308.75					2,500	\$12,150.00
Egg.....	3,413	20,176.51			430	\$2,531.00	800	4,384.00
Stove.....	2,162	13,094.71	100	\$583.00			200	1,096.00
Chestnut.....	45	294.20						
Pea.....	16,490	68,673.50	3,050	10,426.00				
Buckwheat.....	8,000	28,350.00	12,000	30,600.00				
Bituminous.....	61,031	189,730.35			12,260	49,254.60	85,550	212,007.50
Total.....	100,366	371,628.02	15,150	41,609.00	12,690	51,785.60	89,050	229,637.50
	Coal for use outside the District of Columbia.							
Kinds and size of coal.	Navy Department.		Panama Railroad Co.		Treasury Department.		War Department.	
	<i>Tons.</i>	<i>Cost.</i>	<i>Tons.</i>	<i>Cost.</i>	<i>Tons.</i>	<i>Cost.</i>	<i>Tons.</i>	<i>Cost.</i>
Anthracite:								
Broken.....					400	\$2,440.00	850	\$4,794.50
Egg.....					300	1,860.00	1,040	8,528.00
Stove.....							300	1,770.00
Chestnut.....								
Pea.....					1,245	5,054.05	1,400	5,026.00
Buckwheat.....					16,850	44,980.00	3,400	8,330.00
Bituminous.....	55,800	\$154,690.00	695,000	\$1,832,500.00	43,150	143,136.50	54,400	176,993.00
Total.....	55,800	154,690.00	695,000	1,832,500.00	61,945	197,470.55	61,390	205,441.50

Grand total of tons, 1,091,391.

Grand total of cost, \$3,084,762.17.

<sup>a</sup> Based on tonnages specified in proposals and at the contract prices. For detailed data relating to the contracts see Table 6, pp. 23-32.

**AWARD OF CONTRACTS.**

**COMPARISON OF HEATING VALUES<sup>a</sup>.**

In the purchase of coal according to its heating value, an important detail, which seems not to be thoroughly understood, is the manner of making awards. In order to award a contract properly, the proposals should be reduced to a common basis for comparison. The preferable method is to adjust all bids on a given lot of coal to the same ash percentage by selecting as the standard that proposal which offers the coal containing the lowest percentage of ash. Each 1 per cent of ash content above that of this standard is assumed to have a negative value of 2 cents a ton, the amount of the penalty which is exacted under the contract requirements for 1 per cent excess of ash. The proposal prices are all adjusted in this manner and are so tabulated. On the basis of the adjusted price, allowance

<sup>a</sup> The method of comparing bids for the fiscal year 1912-13 will be somewhat different. (See Technical Paper 15, Bureau of Mines: Sampling coal deliveries, with specifications for coal purchases, by G. S. Pope, 1912.)

is then made for the varying heat values by computing the cost of 1,000,000 British thermal units for each coal offered. In this way the three variables—calorific value, percentage of ash, and basic price per ton—are all merged into a single figure, the cost of 1,000,000 British thermal units, by which one bid may be readily compared with another.

An example of this manner of abstracting bids is shown below:

TABLE 2.—*Abstract of proposals for furnishing 1,600 tons of bituminous run-of-mine coal during the fiscal year 1910-11.*

Bidder.	Commer- cial des- ignation of coal. <i>a</i>	Mine and location. <i>a</i>	Coal bed. <i>a</i>	Heating value of coal "as received."	Ash in "dry coal."	Price per ton.		Cost per 1,000,000 B. t. u.
						Bid.	Plus ash differ- ence.	
A.....	.....	.....	.....	<i>B. t. u.</i> 13,400	<i>Per cent.</i> 10.0	\$2.35	\$2.43	<i>Cents.</i> 8.096
B.....	.....	.....	.....	14,000	8.0	3.15	3.19	10.172
C.....	.....	.....	.....	14,600	6.0	3.25	3.25	9.938
D.....	.....	.....	.....	13,000	10.0	3.10	3.18	10.920
E.....	.....	.....	.....	13,000	8.0	2.35	2.39	8.207
F.....	.....	.....	.....	13,000	10.5	2.35	2.44	8.379
G.....	.....	.....	.....	11,500	13.5	2.25	2.40	9.317

*a* These columns are filled in from data given in proposals.

In the above abstract the percentage of ash, 6 per cent, stipulated by bidder C is the lowest percentage of ash in any coal offered. This percentage is taken as the standard of comparison, and the other bids are adjusted by adding to each bid 2 cents for each per cent of ash above 6 per cent. Fractions of a per cent are given pro rata values. Thus, bids \$2.35, \$3.15, and \$3.10 become \$2.43, \$3.19, and \$3.18, respectively. All bids are then on the same basis so far as ash is concerned.

The heating values stipulated by the different bidders being different, the calorific cost is computed for each bid by the formula:

$$\frac{1,000,000 \times \text{price per ton}}{2,240 \times \text{B. t. u.}} = \text{cost per 1,000,000 B. t. u.}$$

Substituting in the formula the values for bid A,

$$\frac{1,000,000 \times \$2.43}{2,240 \times 13,400} = \$0.08096, \text{ or } 8.096 \text{ cents.}$$

In like manner, the cost of 1,000,000 British thermal units is calculated for each bid received under the proposal, and the results are entered for ready comparison in the last column of the table.

The necessity for having such a basis of comparison is evident from an examination of the bids shown in the table. These bids offer guaranties of British thermal units from 11,500 to 14,600, and of ash from 6 to 13.5 per cent, and the prices range from \$2.25 to \$3.25. The cost of 1,000,000 British thermal units ranges from 8.096 to 10.920 cents.

Occasionally, it has been found desirable to award contracts to bidders other than those naming the lowest price per ton. Should two or more proposals appear equally advantageous, the relative suitability of the coals for use in the plant to be supplied may be determined by actual trial tests.

#### OTHER FACTORS.

While calorific rating allows an award to be made to the best economic advantage, other factors than the mere theoretical heating value of the coal may, under certain conditions, have considerable weight, especially where uncertainty exists as to the suitability or adaptability of an untried coal to the plant for which it is purchased, and the consideration of this question must take into account the condition of furnaces, grates, and draft, the labor of handling coal and ash, the storage facilities, etc.

In plants where boiler capacity and grate area are small or draft is weak, only the best grades of coal can be burned, and it is therefore desirable to take bids for coal to be used in such plants on a general specification, so that bids may be received on coals of different quality. With the information obtained, the probable saving which would result in making radical changes in the plant so as to take advantage of the coals offered at lower costs per million heat units can be determined.

The relative facilities, competency, and responsibility of the competing firms must, of course, also be considered in making awards.

#### GOVERNMENT SPECIFICATIONS FOR COAL.<sup>a</sup>

Two classes of coal, anthracite and bituminous, are recognized and differentiated in Government specifications. By anthracite is meant the coal mined in Susquehanna, Lackawanna, Luzerne, Carbon, Schuylkill, Columbia, Sullivan, Northumberland, and Dauphin counties, Pa. By bituminous coal is meant varieties other than anthracite, including the several grades of semibituminous and sub-bituminous.

The specification limits are wide enough to permit the use of the output of any mine or group of mines, provided proper care is exercised in mining and picking out slate, bone, and other impurities. It is only necessary for the bidder to select coal that will meet the description given and will be, as delivered, within the limits set.

Government contracts are based either on a standard heating value for coal "as received" and a standard percentage of ash "dry

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<sup>a</sup> Forms for Government specifications and proposals are given in full in Technical Paper 15, Bureau of Mines: Sampling coal deliveries, with specifications for coal purchases, by G. S. Pope, 1912.

coal" or on an ash "dry-coal" standard only. The former type of contract is always used for bituminous coal and is applicable to anthracite as well; the latter type is applicable to anthracite only. Reference to the list of Government contracts for the fiscal year, 1910-11 (Table 6, pp. 23-32) will show that the double standard is becoming more generally used.

#### THE BRITISH THERMAL UNIT AND ASH STANDARD.

The type of contract based on the heating value and ash content has been used for a number of years by the Treasury Department for the purchase of both bituminous coal and anthracite, and was adopted for the purchase of all coal used by the Government in the District of Columbia during the fiscal year 1910-11.

The specifications for the fiscal year 1910-11 are the same as those used for the purchase of bituminous coal in 1909-10. The form of these specifications is given in full in Bulletin 11 of the Bureau of Mines.<sup>a</sup> The specifications for the purchase of coal by the Government during the fiscal year 1912-13 are somewhat different. In essential features the 1912-13 specifications will differ from the specifications used in the preceding years in that the heating value will be expressed on the "dry-coal" basis, provision being made for variations in the heating value of delivered coal by the establishment of a moisture standard for each contract. They appear in full in Technical Paper 15 of the Bureau of Mines.<sup>b</sup>

The specifications are intended to describe clearly the character of the coal desired by the Government and to enable the bidder to furnish a definite statement of the quality of the coal he offers, this statement to be used as a standard or as a basis for payment in connection with the price stated. The bidder is not required to submit a sample of his coal, but is expected to state the percentage of ash in the "dry coal" and the number of British thermal units in the coal as it is to be delivered. In this connection, the term "dry coal" means coal free from moisture,<sup>c</sup> as determined by drying a small sample at 105° C. (221° F.) for a prescribed period. Obviously, the percentage of ash in the dry coal must be somewhat higher than that in the undried sample.

In addition to stating guaranteed standards as to the yield of British thermal units from coal "as received" and as to the ash in "dry coal," the bidder is required to furnish with each bid the commercial name of the coal he proposes to deliver, the name and location of the mine or mines, and the name or local designation of the coal bed or beds.

<sup>a</sup> The purchase of coal by the Government under specifications by G. S. Pope, pp. 34-40 (reprint of U. S. Geol. Survey Bull. 428).

<sup>b</sup> Sampling coal deliveries, with specifications for coal purchases, by G. S. Pope, 1912.

<sup>c</sup> See p. 80.



It is not expected that all deliveries will be absolutely uniform or agree exactly with the standards established by the contractor, but it is necessary that all deliveries shall be within the limits set by the Government.

The standards established by the contractor should, however, be such as to require the least possible correction in price on account of variation in ash and heat units.

The heating value, expressed in British thermal units, of coal containing approximately the same percentage of ash is essentially a direct measure of its actual value to the purchaser, and for this reason the specifications provide for payment in proportion to the number of heat units contained in the coal as received. As the coal is weighed when delivered and payments are made according to the price per ton, it is necessary to determine the heating value of the coal in the condition in which it is received, with whatever moisture it may then contain.

Under this plan neither the contractor nor the Government will gain or lose by change in the moisture content of the coal between the time it is weighed at the mine and the time it is weighed on delivery. The price per ton will be correspondingly lower if the coal is wet, and higher if it is dry.

A further correction in payment is made for variation of the ash in dry coal in order to take account of the cost of handling additional fuel and ash and of its effect on the capacity of the boiler and furnace.

#### THE ASH STANDARD.

A great deal of anthracite has been purchased by the Government on an ash standard only, and this method has given satisfactory results. A comparison of the heating values of a large number of samples with the corresponding percentages of ash in "dry coal" has indicated that in anthracite coal the percentage of ash in "dry coal" is a good index of the heating value.

In purchasing anthracite coal on the single standard it has been found quite satisfactory for the Government to establish standard percentages of ash for the various sizes of anthracite and then to make price corrections according to a table of premiums and deductions. For this purpose use has been made of the tables given below:<sup>a</sup>

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<sup>a</sup> For tables of price corrections used with contracts for Government coal purchases for the fiscal year 1912-13, see Technical Paper 15, Bureau of Mines: Sampling coal deliveries, with specifications for coal purchases, by G. S. Pope, 1912.

TABLE 3.—List of anthracite sizes, showing contract standards and maximum limits for ash.

Kind and size.	Ash in dry coal (per cent.)	
	Contract standard.	Maximum limit.
White-ash anthracite:		
Furnace.....	10	14
Egg.....	10	14
Stove.....	12	16
Chestnut.....	14	18
Pea.....	16	20
No. 1 buckwheat.....	18	21
No. 2 buckwheat.....	18	21
Red-ash anthracite:		
Stove.....	12	16

TABLE 4.—Price corrections, due to variations in ash in "dry coal" above and below the established standard—anthracite bought on ash standard only.

Ash in "dry coal" (per cent.)	Size of coal.				
	Furnace and egg.	Stove.	Chestnut.	Pea.	Buckwheat.
6.01 to 6.50	24				
6.51 to 7.00	21				
7.01 to 7.50	18				
7.51 to 8.00	15				
8.01 to 8.50		27			
8.51 to 9.00		24			
9.01 to 9.50		21			
9.51 to 10.00		18			
10.01 to 10.50	Contract price.	15	27		
10.51 to 11.00			24		
11.01 to 11.50			21		
11.51 to 12.00			18		
12.01 to 12.50	15	Contract price.	15		
12.51 to 13.00	18			15	
13.01 to 13.50	21			12.5	
13.51 to 14.00	24			10	
14.01 to 14.50			Contract price.	7.5	
14.51 to 15.00		15		5	
15.01 to 15.50		18			12
15.51 to 16.00		21			10
16.01 to 16.50		24			8
16.51 to 17.00		27			6
17.01 to 17.50			15		4
17.51 to 18.00			18		
18.01 to 18.50			21	5.0	
18.51 to 19.00			24	7.5	Contract price.
19.01 to 19.50			27	10.0	
19.51 to 20.00				12.5	
20.01 to 20.50				15.0	4
20.51 to 21.00					8
21.01 to 21.50					14
21.51 to 22.00					21
					32
					48

NOTE.—Figures above heavy line represent cents per ton to be added to contract price; figures below heavy line represent cents per ton to be deducted from contract price.

#### CONTRACTS FOR COAL FOR THE FISCAL YEAR 1910-11.

A list of contracts made during the fiscal year 1910-11 for coal required for Government use, under specifications providing for payment according to quality, is given in Table 6, on pages 23 to 32.

## RESULTS OF ANALYSES.

## AVERAGE QUALITY OF DELIVERED ANTHRACITE.

Table 5 shows the general average of moisture, heating value, volatile matter, and ash in the several sizes of anthracite coal delivered to the Government in Washington for the fiscal years 1907, 1908, 1909, and 1910.

TABLE 5.—General average quality of anthracite delivered to the Government in Washington, fiscal years 1907–1910.

Size.	Moisture, 1906-7 <sup>a</sup> (per cent).	Volatile matter in dry coal, 1906-7 <sup>a</sup> (per cent).	B. t. u., 1906-7. <sup>a</sup>		Ash in dry coal (per cent).			
			As re- ceived.	Dry coal.	1906-7	1907-8	1908-9	1909-10
Broken (furnace).....	4.08	2.42	12,861	13,408	10.44	10.00	10.73	10.14
Egg.....	4.16	3.10	12,961	13,523	10.57	10.83	11.55	11.37
Stove.....						12.05	13.20	12.91
Pea.....	4.81	3.02	11,886	12,487	16.04	16.23	15.62	15.45
No. 1 buckwheat.....	5.09	2.42	11,485	12,107	18.05	15.93	17.81	18.60
No. 2 buckwheat.....						17.13	19.30	18.60

<sup>a</sup> Not determined in succeeding years.

## BITUMINOUS COALS ANALYZED.

The 3-year averages of the analyses made in connection with all contracts for bituminous coal during the fiscal years 1908, 1909, and 1910, have been assembled in Table 7 (pp. 33–36) according to the State and county in which the coal was mined. More detailed information concerning any of the analyses in this table may be found by referring to the bulletin and page indicated in the last two columns of the table.

## DETAILS OF ANALYSES FOR THE FISCAL YEAR 1909-10.

Table 9 (pp. 37–73) gives the analyses of coal delivered for Government use during the fiscal year 1909–10, and shows the results of purchasing coal under specifications. The name of the place of delivery and other details are stated at the head of each subdivision of the table. In the statement of the standards of quality, percentage of ash is understood to refer to “dry coal,” and British thermal units to coal “as received.” The kind of coal is bituminous, except as otherwise stated, and the quantities are long tons, 2,240 pounds. The average corrected price per ton is based on the average analysis.

To give a general idea of the quality of the coal delivered during the year, the average quality of the coal delivered each month or of the coal covered by a certain part of the contract is stated. From these results and their respective weights the yearly average was determined. Some wide departures from the standard of monthly

values will be noted, both as to penalty and as to bonus; but these departures may so balance one another that the general average of results closely approximates that of the standards specified. This statement is true not only of monthly averages, but of averages covering longer periods.

In order that the reader may understand the figures for "corrected price per ton" in Table 9, the method of determining such corrections for bituminous coals and for those anthracite coals purchased under the double standard is explained here.

Corrections for variations in heating value above or below the standard established in the contract were proportional and were determined by the following formula:

$$\frac{\text{Delivered B. t. u.}}{\text{Standard B. t. u.}} \times \text{contract price} = \text{price to be paid.}$$

For example, if a coal delivered on a contract guaranteeing 14,000 British thermal units in coal "as received," at a price of \$3 per ton, shows by calorific test 14,300 British thermal units "as received," the price to be paid was, by substituting these figures in the formula,

$$\frac{14,300}{14,000} \times \$3 = \$3.064.$$

The price was further corrected for variations in ash in "dry coal," as follows:

A premium of 1<sup>a</sup> cent per ton for each whole per cent above the standard established by the contractor did not entail a penalty for the excess of ash. When such excess exceeded 2 per cent above the standard established, deductions were made from the price paid per ton in accordance with Table 8 (p. 37).

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<sup>a</sup> For the fiscal year 1910-11 a premium of 2 cents per ton was allowed.

RESULTS OF ANALYSES.

TABLE 6.—Government contracts for coal under specifications for the fiscal year 1910-11.

Location.			Abstract of contract.						
City.	Place of delivery.	Department or bureau.	Kind of coal (bituminous, except as otherwise stated).	Commercial designation of coal.	Mine and location.	Bed.	Ash in "dry coal" (per cent).	B. t. u. "as received."	Price per ton.
Colorado: Denver.....	Courthouse and post office.	Treasury.....	Pea anthracite.....	Ruby.....	Ruby mine, Floresta, Colo.	Ruby anthracite.	10	13,300	\$4.75
Do.....	Mint.....	do.....	Run of mine.....	Pinnacle.....	Pinnacle mine, Oak Creek, Routt Co., Colo.	Mammoth..	5	12,320	4.35
Grand Junction. District of Columbia: Washington.....	Indian School.....	Interior.....	do.....	Book Cliff.....	Book Cliff mine, Little Book Cliff, Grand Junction, Colo.	Book Cliff or Cameo.	8.50	11,850	2.55 2.75
Do.....	Bethesda, Md.....	Agriculture.....	Broken anthracite <sup>b</sup> .....	Sayre.....	Sayre mine, Mount Carmel, Pa.	Mammoth..	10	13,000	6.65
Do.....	do.....	do.....	Stove anthracite.....	do.....	do.....	do.....	14	13,000	7.05
Do.....	Main buildings.....	do.....	Broken anthracite.....	Susquehanna.....	Wyoming region, Nanticoke, Pa.	do.....	10	12,650	5.43
Do.....	do.....	do.....	Egg anthracite.....	do.....	do.....	do.....	12	12,400	5.89
Do.....	do.....	do.....	Stove anthracite.....	do.....	do.....	do.....	14	12,200	6.25
Do.....	do.....	do.....	Forge.....	New River.....	Fayette and Raleigh Counties, W. Va.	do.....	5	14,600	3.25
Do.....	do.....	do.....	Run of mine.....	do.....	do.....	do.....	5	14,750	3.20
Do.....	Weather Bureau.....	do.....	Broken anthracite.....	Sayre.....	Sayre mine, Mount Carmel, Pa.	Mammoth..	10	13,000	5.64
Do.....	do.....	do.....	Stove anthracite.....	do.....	do.....	do.....	14	13,000	6.72
Do.....	do.....	do.....	Forge.....	New River.....	Fayette and Raleigh Counties, W. Va.	Sewell.....	5	14,600	3.25
Do.....	Bureau of Fisheries.	Commerce and Labor.....	Egg anthracite.....	Philadelphia & Reading.....	Pennsylvania.....	do.....	10	12,700	5.97
Do.....	Bureau of Standards.	do.....	No. 1 buckwheat anthracite.....	do.....	do.....	do.....	18	11,300	4.20
Do.....	Census building.	do.....	Egg anthracite.....	do.....	do.....	do.....	10	12,700	5.95
Do.....	Census annex No. 1.	do.....	do.....	do.....	do.....	do.....	10	12,700	5.95
Do.....	Census annex No. 2.	do.....	do.....	do.....	do.....	do.....	10	12,700	5.95
Do.....	Coast and Geodetic Survey.	do.....	Broken anthracite.....	do.....	Coieraine mine, Hazelton, Pa.	Mammoth and Buck Mountain.	10	13,000	5.49

<sup>b</sup> Broken coal is also called furnace coal.

<sup>a</sup> Tons of 2,000 pounds.

## GOVERNMENT COAL PURCHASES.

TABLE 6.—Government contracts for coal under specifications for the fiscal year 1910-11—Continued.

Location.		Abstract of contract.								
City.	Place of delivery.	Department or bureau.	Estimate of tons of 2,240 pounds.	Kind of coal (bituminous, except as otherwise stated).	Commercial designation of coal.	Mine and location.	Bed.	Ash in "dry coal" (per cent).	B. t. u. "as received."	Price per ton.
District of Columbia—Contd.										
Washington	Department building	Commerce and Labor	160	Broken anthracite	Philadelphia & Reading.	Pennsylvania.		10	12,870	\$5.65
Do	Botanic Gardens	Nat. Botanic Garden.	300	do.		Coleraine mine, Hazleton, Pa.	Mammoth and Buck Mountain.	10	13,000	5.44
Do	do.	do.	20	Chestnut anthracite.		Parker mine, Shemandoah, Pa.	do.	13	13,000	6.09
Do	Government Printing Office.	Government Printing Office.	10,000	Egg anthracite	Philadelphia & Reading.	Pennsylvania.		10	12,700	5.79
Do	do.	do.	10,000	Pea anthracite.	do.	do.		16	12,000	4.12
Do	Library of Congress.	do.	3,700	Broken anthracite.	do.	Coleraine mine, Hazleton, Pa.	Mammoth and Buck Mountain.	10	13,000	5.42
Do	Civil Service Commission	Interior.	250	do.	Philadelphia & Reading.	Pennsylvania.		10	12,870	5.60
Do	Freedmen's Hospital	do.	25	Egg anthracite	do.	do.		10	12,800	6.20
Do	do.	do.	1,800	Run of mine	Elk Lick.	Elk Lick mines, West Salisbury, Pa.	Georges Creek	7	14,000	3.27
Do	Government Hospital for the Insane.	Interior.	1,000	Stove anthracite.	Schuylkill.	Back Run, Schuylkill County, Pa.	Locus Mountain.	8	13,000	5.59
Do	do.	do.	20,000	Run of mine	Elk Lick.	Elk Lick mine, West Salisbury, Pa.	Georges Creek	7	14,000	2.80
Do	Howard University.	do.	200	Broken anthracite.	Philadelphia & Reading.	Pennsylvania.		10	12,870	5.75
Do	do.	do.	125	Stove anthracite.	do.	do.		12	12,400	6.70
Do	Land Office.	do.	4,000	Run of mine	Jenner.	Jenner mine, Boswell, Pa.	C.	7	14,200	3.23
Do	Pension Office.	do.	575	Broken anthracite.	Philadelphia & Reading.	Pennsylvania.		10	12,870	5.53
Do	United States Geological Survey	do.	600	do.	do.	do.		10	12,870	5.75
Do	1013 15th Street.	Justice	30	Egg anthracite.	do.	do.		10	12,700	6.05
Do	6 Jackson Place.	do.	30	do.	do.	do.		10	12,500	6.04
Do	8 Jackson Place.	do.	25	do.	Susquehanna.	do.		10	12,500	6.04

RESULTS OF ANALYSES.

Do.....	1485 K Street.....	do.....	175	do.....	Philadelphia & Reading.	do.....	10	12,700	5.95
Do.....	1489 K Street.....	do.....	30	do.....	Susquehanna.....	Wyoming region, Nanticoke, Pa.	12	12,400	5.94
Do.....	do.....	do.....	10	Chestnut anthracite.....	Philadelphia & Reading.	Packer mine, Shenandoah, Pa.	15	12,000	6.44
Do.....	United States Jail.....	do.....	25	Stove anthracite.....	do.....	Mammoth Mountain.	12	13,000	6.19
Do.....	do.....	do.....	500	Run of mine.....	Orenda.....	Orenda mine, Boswell, Pa.	7	14,000	3.44
Do.....	1000 Vermont Ave.....	do.....	48	Egg anthracite.....	Philadelphia & Reading.	C.....	10	12,700	6.22
Do.....	Mills Building.....	Navy.....	500	No. 1 buckwheat anthracite.....	Susquehanna.....	do.....	18	11,700	3.30
Do.....	do.....	do.....	100	Run of mine.....	New River.....	Fayette and Raleigh Counties, W. Va.	5	14,650	3.25
Do.....	Naval Medical School Hospital.....	do.....	3,000	do.....	Georges Creek.....	Ocean mine, Frostburg, Md.	7	14,200	3.37
Do.....	Naval Observatory.....	do.....	600	Broken anthracite.....	Philadelphia & Reading.	Pennsylvania.....	10	12,870	6.05
Do.....	do.....	do.....	15	Egg anthracite.....	do.....	do.....	10	12,800	6.50
Do.....	Post Office annex.....	Post Office.....	450	Pea anthracite.....	do.....	do.....	16	12,000	4.15
Do.....	Post Office Building.....	do.....	6,000	do.....	Lehigh.....	Packer mine, Shenandoah, Pa.	16	12,000	4.24
Do.....	do.....	do.....	10	Stove anthracite.....	Philadelphia & Reading.	Pennsylvania.....	12	12,400	6.62
Do.....	Post Office carpenter shop.....	do.....	40	Pea anthracite.....	do.....	do.....	16	12,000	4.15
Do.....	Post Office mail-lock shop.....	do.....	10	Stove anthracite.....	do.....	do.....	12	12,400	6.70
Do.....	Post Office stables.....	do.....	95	Broken anthracite.....	do.....	do.....	10	12,870	6.40
Do.....	National Zoological Park.....	Smithsonian Institution.....	15	Stove anthracite.....	do.....	do.....	12	12,500	7.20
Do.....	do.....	do.....	15	Chestnut anthracite.....	Jenner.....	Jenner mine, Somerset County, Pa.	13	12,500	7.20
Do.....	do.....	do.....	300	Run of mine.....	do.....	do.....	7	14,200	3.85
Do.....	New National Museum.....	do.....	4,500	do.....	New River.....	Fayette and Raleigh Counties, W. Va.	5	14,500	3.24
Do.....	Bureau of Citizenship.....	State.....	45	Broken anthracite.....	Philadelphia & Reading.	Pennsylvania.....	10	12,870	5.75
Do.....	State stables.....	do.....	15	Stove anthracite.....	Susquehanna.....	do.....	12	12,400	6.70
Do.....	State, War, and Navy Building.....	State, War, and Navy.....	4,000	No. 1 buckwheat anthracite.....	do.....	do.....	18	11,700	3.30
Do.....	do.....	do.....	500	Run of mine.....	New River.....	Fayette and Raleigh Counties, W. Va.	5	14,700	3.25
Do.....	Executive Mansion.....	War.....	210	Broken anthracite.....	Summit.....	Lehigh mines, Pa.	10	12,750	5.50
Do.....	do.....	do.....	76	Stove anthracite.....	Susquehanna.....	Wyoming and Schuylkill Counties, Pa.	12	12,600	6.70
Do.....	Executive Mansion stables.....	do.....	20	do.....	do.....	do.....	12	12,600	6.50

<sup>a</sup> Alternate bids; total tonnage all of one coal, or of two or three coals.

## GOVERNMENT COAL PURCHASES.

TABLE 6.—Government contracts for coal under specifications for the fiscal year 1910-11—Continued.

Location.			Abstract of contract.							
City.	Place of delivery.	Department or bureau.	Estimated tons of 2,240 pounds.	Kind of coal (bituminous, except as otherwise stated).	Commercial designation of coal.	Mine and location.	Bed.	Ash in "dry coal" (per cent).	B. t. u. "as received."	Price per ton.
District of Columbia—Contd.										
Washington	Executive Office Building.	War	60	Broken anthracite.	Summit.	Lehigh mines, Pa.		10	12,750	\$5.50
Do.	Greenhouses.	do.	1,000	Egg anthracite.	Susquehanna.	do.		10	12,800	5.60
Do.	Highway Bridge.	do.	10	Stove anthracite.	do.	Wyoming and Schuylkill Counties, Pa.	Lee.	12	12,600	7.00
Do.	Monument.	do.	170	Egg anthracite.	do.	do.	do.	9	12,700	6.70
Do.	Shops at nursery.	do.	30	Broken anthracite.	Summit.	Lehigh mines, Pa.		10	12,750	5.30
Do.	do.	do.	4	Red-ash stove anthracite.	Susquehanna.	do.		14	12,000	6.50
Do.	do.	do.	24	Run of mine.	New River.	Loup Creek mines, Fayette and Raleigh Counties, W. Va.	Sewell and Beckley.	5	14,600	3.40
Do.	Stables.	War.	5	Stove anthracite.	Susquehanna.	Wyoming and Schuylkill Counties, Pa.	Lee.	12	12,600	6.50
Do.	Bureau of Engraving and Printing.	Treasury	8,500	Run of mine.	New River.	Fayette and Raleigh Counties, W. Va.	Sewell.	4	14,710	3.19
Do.	Butler Building.	do.	250	Broken anthracite.		Coleraine, Hazelton, Pa.	Mammoth and Buck mountains.	10	13,000	5.53
Do.	Cox Building.	do.	50	Egg anthracite.	Philadelphia & Reading.	Pennsylvania.		10	12,700	6.15
Do.	Hygienic Laboratory.	do.	300	do.	Sayre.	Sayre mine, Mount Carmel, Pa.	Mammoth.	10	13,000	6.00
Do.	do.	do.	30	Stove anthracite.	Susquehanna.	Wyoming region, Nanticoke, Pa.		14	12,200	6.45
Do.	Treasury building.	do.	10	do.	Philadelphia & Reading.	Pennsylvania.	Mammoth.	12	12,500	6.70
Do.	do.	do.	α 1,500	No. 1 buckwheat anthracite.	do.	do.		18	11,300	3.40
Do.	do.	do.	α 1,500	No. 2 buckwheat anthracite.	do.	do.		18	11,200	2.85
Do.	do.	do.	1,200	Run of mine.	New River.	Fayette and Raleigh Counties, W. Va.	Sewell.	5	14,700	3.30
Do.	Treasury stables.	do.	15	Stove anthracite.	Susquehanna.	Wyoming region, Nanticoke, Pa.		12	12,400	6.50



RESULTS OF ANALYSES.

Do.	Winder Building.	do.	do.	10	Philadelphia & Reading.	Pennsylvania.	12	12,500	6.70
Do.	do.	do.	do.	400	Run of mine.	Fayette and Raleigh Counties, W. Va.	5	14,700	3.35
Do.	Army Medical Museum.	War.	do.	325	Broken anthracite.	Wyoming region, Nanticoke, Pa.	10	12,650	5.49
Do.	1725 F Street.	do.	do.	43	Egg anthracite.	Pennsylvania.	10	12,500	6.14
Do.	1800 F Street.	do.	do.	44	do.	do.	10	12,500	6.14
Do.	do.	do.	do.	6	Stove anthracite.	Wyoming region, Nanticoke, Pa.	14	12,200	6.50
Do.	Filtration plant.	do.	do.	3,600	Run of mine.	Boswell, Somerset County, Pa.	7	14,100	3.29
Do.	Ford Building.	do.	do.	350	Stove anthracite.	Wyoming region, Nanticoke, Pa.	14	12,200	6.33
Do.	1712 G Street.	do.	do.	13	Egg anthracite.	Pennsylvania.	10	12,500	6.14
Do.	do.	do.	do.	8	Stove anthracite.	do.	12	12,400	6.85
Do.	1744 G Street.	do.	do.	70	Egg anthracite.	Wyoming region, Nanticoke, Pa.	12	12,400	6.05
Do.	Ishman Canal Commission.	do.	do.	125	Broken anthracite.	do.	10	.....	5.54
Do.	Lemon Building.	do.	do.	285	Egg anthracite.	Pennsylvania.	10	12,700	5.98
Do.	610 Seventeenth Street.	do.	do.	75	Broken anthracite.	Wyoming region, Nanticoke, Pa.	10	12,650	5.49
Do.	United States Soldiers' Home.	do.	do.	300	Stove anthracite.	Pennsylvania.	10	12,250	6.35
Do.	do.	do.	do.	6,600	Run of mine.	Orenda mine, Boswell, Pa.	7	14,000	3.31
Do.	War Department stables.	do.	do.	10	Egg anthracite.	Pennsylvania.	10	12,700	5.98
Do.	do.	do.	do.	10	Stove anthracite.	do.	12	12,400	6.50
Florida:	Navy yard.	Navy.	do.	1,700	Run of mine.	Eldorado, Ala.	7	14,800	3.25
Illinois:	Appraiser's stores.	Treasury.	do.	500	Washed lump.	Big Creek No. 2, Saline County, Ill.	9.89	12,400	3.33
Do.	Courthouse and post office.	do.	do.	7,500	do.	do.	9.89	12,400	3.33
Danville.	Danville Branch.	N. H. D. V. S. b.	do.	350	Lump.	Electric mine, 4 miles west of Danville, Ill.	10	12,000	1.95
Do.	do.	do.	do.	17,500	Broken lump.	do.	18	10,500	1.50
Rock Island.	Rock Island Arsenal.	War.	do.	1,000	Egg anthracite.	Beaver Brook mines, Audenried, Pa.	6.75	.....	8.30
Do.	do.	do.	do.	300	Smithing.	Mines Nos. 1 and 2, Hooversville, Pa.	5	13,600	4.79
Do.	do.	do.	do.	6,000	Run of mine.	Empire mines, Bartlett, Ill.	14	11,000	2.23
Indiana:	Marion Branch.	N. H. D. V. S. b.	do.	10,000	Nut, pea, and slack.	Chattaroy, W. Va.	9	12,500	2.25
National Military Home.	do.	do.	do.	.....	Buffalo white ash.	Winfrede.	.....	.....	.....

<sup>b</sup> National Home for Disabled Volunteer Soldiers.

<sup>a</sup> Alternate bid; total tonnage all of one coal, or of two or three coals.

## GOVERNMENT COAL PURCHASES.

TABLE 6.—Government contracts for coal under specifications for the fiscal year 1910-11—Continued.

Location.			Abstract of contract.							
City.	Place of delivery.	Department or bureau.	Estimated tons of pounds.	Kind of coal (bituminous, except as otherwise stated).	Commercial designation of coal.	Mine and location.	Bed.	Ash in "dry coal" (per cent).	B. t. u. "as received."	Price per ton.
Iowa:										
Toledo.....	Sac and Fox Indian School.	Interior.....	a 200	Lump.....	Black Brier.....	Black Brier mine, Johnson City, Ill.	No. 6.....	12	12,000	\$1.75
Kansas:										
Horton.....	Kickapoo Indian School.	do.....	a 200	do.....	do.....	do.....	do.....	12	12,000	1.75
Kentucky:										
Louisville.....	Courthouse and post office.	Treasury.....	1,600	Through 2½-inch screen				10	13,400	2.35
Louisiana:										
New Orleans.....	Customhouse.....	do.....	1,550	Lump.....		Pratt No. 5, Pratt City, Ala.	Pratt.....	6	14,500	3.50
Maine:										
National Soldiers' Home.	Eastern Branch...	N. H. D. V. S. b.	2,500	Broken anthracite....	Packer or Sandy Run.	Packer Mahanoy region or Sandy Run, Wyoming region, Pa.		10	.....	4.86
Do.....	do.....	do.....	800	Egg anthracite.....	do.....	do.....		10	.....	5.48
Do.....	do.....	do.....	200	Stove anthracite.....	do.....	do.....		12	.....	5.48
Maryland:										
Annapolis.....	Naval Academy...	Navy.....	16,000	Run of mine.....	Cardiff.....	Cardiff mines, Cambria County, Pa.	B.....	5	14,300	2.75
Baltimore.....	Appraiser's stores, courthouse, customhouse, and post office.	Treasury.....	2,650	do.....	do.....	do.....	B.....	5	14,300	3.13
Do.....	Customhouse.....	do.....	500	Anthracite screenings.		Buck Run mine, Schuylkill region, Pa.	Mammoth..	18	11,000	2.40
Massachusetts:										
Boston.....	Post office and subtreasury.	do.....	3,000	do.....	Erie, Lackawanna, and Philadelphia & Reading.	Pennsylvania.....		13	12,600	2.70
Do.....	do.....	do.....	1,500	Run of mine.....	Pocahontas or New River.	West Virginia.....		6	14,350	4.05
Springfield.....	Springfield Armory.	War.....	5,000	do.....	Ben Par.....	Ben Par mines, Twin Rocks, Pa.	Miller.....	7	14,600	4.55
Watertown.....	Watertown Arsenal.	do.....	400	Broken anthracite....	Lehigh.....	Summit Hill mine, Pa.....	Lehigh.....	8	.....	5.63



## GOVERNMENT COAL PURCHASES.

TABLE 6.—Government contracts for coal under specifications for the fiscal year 1910-11—Continued.

Location.			Abstract of contract.							
City.	Place of delivery.	Department or bureau.	Estimated tons of 2,240 pounds.	Kind of coal (bituminous except as otherwise stated).	Commercial designation of coal.	Mine and location.	Bed.	Ash in "dry coal" (per cent).	B. t. u. "as received."	Price per ton.
New Mexico:										
Dulce.....	Jcarilla Indian schools.	Interior.....	a 300	Run of mine.....		Monero No. 1 mine, Monero, N. Mex.	Lower.....	6	13,500	\$4.65
Do.....	do.....	do.....	30	do.....		do.....	do.....	6	13,500	4.00
Mescalero.....	Mescalero Agency.	do.....	a 150	4-inch screen.....	Dawson.....	No. 1 mine, Dawson, Okla.	Raton.....	12	13,000	5.30
New York:										
Albany.....	Customhouse.....	Treasury.....	200	Run of mine.....	Clearfield.....	Aetna Slope mine, Portage, Pa.	E.....	8	14,000	3.55
Brooklyn.....	Courthouse and post office.	do.....	5,000	No. 2 buckwheat anthracite.	Pittston.....	Pennsylvania.....		18	11,150	2.90
Buffalo.....	Post office.....	do.....	1,000	¾-inch lump.....	Reynoldsville.....	Florence and Eleanora mines, Punxsutawney, Jefferson County, Pa.	Freeport.....	6½	14,000	3.14
Ellis Island.....	Immigration station.	Commerce and Labor.	100	Stove anthracite.....				10	13,500	5.83
Do.....	do.....	do.....	2,250	Pea anthracite.....				16	12,200	3.40
Do.....	do.....	do.....	800	do.....				16	12,200	3.47
Do.....	do.....	do.....	12,000	No. 1 buckwheat anthracite.				18	12,000	2.55
New York:										
Do.....	Appraiser's warehouse.	Treasury.....	2,500	Anthracite screenings.	Philadelphia & Reading.	Pennsylvania.....		17	12,000	2.44
Do.....	Barge office.....	do.....	500	No. 1 pea anthracite.....	Vinton.....	do.....		14	12,190	3.98
Do.....	Courthouse and post office.	do.....	11,000	Run of mine.....	Vinton.....	Vinton mine, Vintondale, Pa.	Miller.....	6	14,100	3.31
Do.....	Customhouse.....	do.....	2,500	Buckwheat anthracite	East Boston.....	East Boston mine, Kingstons, Pa.	Red Ash and Baltimore.	16	11,500	2.90
Do.....	Subtreasury.....	do.....	150	No. 1 pea anthracite.....				14	12,200	4.20
Do.....	Panama R. R. Co.	do.....	150,000	Run of mine.....				14,000	2.77	
Rochester.....	Courthouse and post office.	Treasury.....	400	Grate anthracite.....	Wilkes-Barre.....	East Boston mine, Kingstons, Pa.		7.1	13,000	6.10
Syracuse.....	do.....	do.....	300	Egg anthracite.....	Reading.....	Schuylkill County, Pa.	Mammoth..	8.37	14,000	6.20
North Carolina:	Engineer office...	War.....	a10,500	Run of mine.....						
Wilmington.....	do.....	do.....		Lump and slack.....	Milburn gas coal.	Keeferton, W. Va.		6	14,300	2.50
Ohio:	Central Branch...	N. H. D. V. S. c.	27,000	do.....						
National Military Home.	do.....	do.....	2,000	do.....				6	14,300	2.15

RESULTS OF ANALYSES.

Toledo.....	Treasury.....	400	Over 3-inch bar.....	Quemahoning smoketess.....	Jerome mine, Somerset County, Pa.....	6	14,300	3.62
Oklahoma: Anadarko.....	Interior.....	a 200	Lump.....	McAlester.....	Buck No. 6 mine, Buck, Okla.....	5	13,000	5.75
Cantonment.....	do.....	a 110	do.....	do.....	do.....	5	13,000	5.85
Colony.....	do.....	a 180	do.....	do.....	do.....	5	13,000	5.75
Gotebo.....	do.....	a 300	do.....	do.....	do.....	5	13,000	5.95
Lawton.....	do.....	a 300	do.....	do.....	do.....	5	13,000	5.05
Pawnee.....	do.....	a 100	do.....	do.....	do.....	5	13,000	5.35
Do.....	do.....	a 60	Nut.....	do.....	do.....	5	13,000	5.95
Sac and Fox Agency.....	do.....	a 110	Lump.....	do.....	do.....	5	13,000	5.35
Shawnee.....	do.....	a 180	do.....	Buck.....	McAlester mine, Buck, Okla.....	4.74	13,000	5.10
Washington.....	do.....	a 40	do.....	McAlester.....	Buck No. 6 mine, Buck, Okla.....	5	13,000	6.60
Pennsylvania: Carlisle.....	do.....	a 400	Anthracite.....	Lehigh prepared.....	Morea or Kaska William mines, Morea or Kaska, Pa.....	12	14,000	5.75
Do.....	do.....	a 2,200	Run of mine.....	Orenda.....	Orenda mine, Boswell, Pa.....	7	14,000	2.40
Do.....	do.....	a 2,200	do.....	Jerome.....	Jerome, Jerome, Pa.....	7	14,000	2.40
Do.....	do.....	a 2,200	do.....	Elk Dick.....	Elk Dick No. 3 mine, West Salsbury, Pa.....	7	14,000	2.49
Philadelphia.....	Treasury.....	470	Pea anthracite.....	do.....	do.....	16.7	12,000	3.74
Do.....	do.....	3,200	Barley anthracite.....	Susquehanna.....	Susquehanna mines, Nanti- cola, Pa.....	12	12,000	2.25
Do.....	do.....	600	Run of mine.....	Cardiff.....	Cardiff mine, Twin Rocks, Pa.....	5	14,300	3.22
Do.....	War.....	16,000	do.....	Powelton.....	(Storing mines Nos. 1, 2, 3, 4, 5, and 6, Cambria County, Pa.....	8.5	14,100	{ 2.90 3.30
Do.....	do.....	7,000	do.....	Cardiff.....	Cardiff mines, Cambria County, Pa.....	5	14,300	2.69
Do.....	Treasury.....	3,500	do.....	do.....	do.....	5	14,300	3.09
Do.....	Navy.....	17,000	do.....	Salsbury.....	Elk Dick No. 3 mine, West Salsbury, Pa.....	7	14,100	2.54

a Tons of 2,000 pounds.  
 b Contracts made for periods of one or three months. Tonnage is estimated quantity required per year.  
 c National Home for Disabled Volunteer Soldiers.  
 d Alternate bids: total tonnage all of one coal, or of two or three coals.  
 e Contract expired Jan. 31, 1911.

## GOVERNMENT COAL PURCHASES.

TABLE 6.—Government contracts for coal under specifications for the fiscal year 1910-11—Continued.

Location.			Abstract of contract.							
City.	Place of delivery.	Department or bureau.	Estimated tons of coal, 2,240 pounds.	Kind of coal (bituminous, except as otherwise stated).	Commercial designation of coal.	Mine and location.	Bed.	Ash in "dry coal" (per cent).	B. t. u. "as received."	Price per ton.
South Carolina: Charleston.....	Navy yard.....	Navy.....	3,600	Run of mine.....	Big Vein Pocahontas.	Big Vein mines Nos. 1 and 2, Pocahontas, Va.	No. 3.....	5	15,000	\$3.60
Do <sup>a</sup> .....	Engineer office.....	War.....	b 2,400	do.....	(Pocahontas and New River.	West Virginia.....	.....	6	14,500	{ 3.33 3.23
South Dakota: Hot Springs.....	Battle Mountain Sanitarium.	N. H. D. V. S. <sup>c</sup>	7,000	do.....	Sheridan.....	Sheridan mines, near Dietz, Wyo.	.....	5	10,500	3.30
Rapid City.....	Rapid City Indian School.	Interior.....	b 800	Screened lump.....	Carney.....	Carney mine, Carneyville, Wyo.	Carney.....	3	10,500	4.70
Tennessee: National Soldiers' Home.	Mountain Branch.	N. H. D. V. S. <sup>c</sup>	1,200	Run of mine.....	Clinchfield.....	.....	.....	8	13,500	1.50
Virginia: National Soldiers' Home.	Southern Branch.	do.....	12,000	do.....	Blake New River smokeless.	New River district, W. Va..	Fire Creek..	4	14,750	2.89
Norfolk.....	Naval hospital.....	Navy.....	2,500	do.....	Pocahontas.....	Crane Creek and Pinnacle mines, Mercer County, W. Va.	No. 3.....	6	14,500	2.93
Do.....	Navy yard.....	do.....	15,000	do.....	Big Vein Pocahontas.	Big Vein Nos. 1 and 2 mines, Pocahontas, Va.	No. 3.....	5	15,000	2.78
Do.....	Panama R. Co.	do.....	200,000	do.....	Pocahontas.....	Fayette and Raleigh Counties, W. Va.	.....	14,600	14,600	2.60
Do.....	do.....	do.....	120,000	do.....	do.....	do.....	do.....	14,600	14,600	2.60
Do.....	do.....	do.....	150,000	do.....	do.....	do.....	do.....	14,600	14,600	2.60
Do.....	do.....	do.....	75,000	do.....	New River.....	.....	.....	14,600	14,600	2.60
Wisconsin: Milwaukee.....	Courthouse and post office.	Treasury.....	1,200	Screenings.....	Youghioheny.....	Youghioheny district, Pa.	.....	19.5	13,700	3.50
National Home.....	Northwestern Branch.	N. H. D. V. S. <sup>c</sup>	8,500	Run of mine.....	New River smokeless.	McDonald and Glen Jean, Fayette County, W. Va.	.....	6	14,750	3.67

<sup>a</sup> Contracts made for varying periods. Tonnage figures represent estimated quantity required per year.<sup>b</sup> Tons of 2,000 pounds.<sup>c</sup> National Home for Disabled Volunteer Soldiers.

RESULTS OF ANALYSES.

TABLE 7.—*Bituminous coals sampled and analyzed during fiscal years 1908 to 1910, inclusive.*

State and county.	Where mined.		Commercial name of coal. <sup>a</sup>	Tons delivered.	Proximate analysis "as received."						B. t. u.		Reference. <sup>b</sup>
	Bed.	Mine and location.			Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.	Ash in "dry coal."	"As received"	"Dry coal."	
Alabama:													
Bibb.		Belle Ellen mine.	Belle Ellen.	1,472	2.18	32.39	55.20	10.23	0.87	10.46	13,318	13,615	52
Do.		Blocton.	Blocton Cahaba red-ash lump.	1,472	1.90	32.84	60.68	4.88	1.05	14,380	14,688	50	
Jefferson.		Pratt City.	Pratt lump.	981	1.34	30.55	58.88	9.34	2.10	9.36	13,916	14,105	378
Do.		Mineral Springs group.	do.	1,337	1.33	30.90	59.01	8.54	1.92	9.36	13,844	14,030	11
Do.		do.	do.	1,308	1.65	29.06	62.20	7.67	1.50	8.67	13,886	14,105	11
Do.		Pratt mines.	Pratt City.	1,280	1.26	29.06	63.24	6.45	1.55	7.75	14,137	14,289	43
Do.		do.	do.	148	1.26	29.06	63.24	6.45	1.55	6.55	14,399	14,583	44
Colorado:		Green Cañon mines.	Green Cañon.	1,280	3.87	35.48	47.98	12.67	.72	13.18	12,320	12,816	41
Las Animas.		Pana.	Pana Nos. 1 and 2 washed nut.	564	6.76	34.33	47.86	11.05	2.37	11.85	11,907	12,770	40
Illinois:		Christian.	do.	6,065	7.08	34.94	48.60	9.38	2.19	10.10	12,151	13,076	40
Do.		do.	do.	599	8.56	34.94	48.60	9.38	2.19	9.90	11,927	13,044	378
Franklin.		Zeigler No. 1.	do.	1,245	8.11	34.94	48.60	9.38	2.19	15.65	11,303	12,094	378
Do.		do.	do.	1,201	8.11	34.94	48.60	9.38	2.19	13.34	11,425	12,433	378
Do.		do.	do.	3,368	10.36	34.94	48.60	9.38	2.19	13.35	11,278	12,567	378
Macoupin.		Staubton mine No. 7.	Staubton lump.	3,468	11.29	35.95	41.41	11.35	3.80	12.79	10,903	12,291	11
Do.		do.	do.	3,284	10.89	36.93	39.80	12.38	3.90	13.89	10,828	12,151	55
Do.		Staubton mine No. 2.	Staubton.	641	12.41	33.02	39.56	15.01	2.70	17.14	10,426	11,903	11
Peoria.		Empire Mine.	Empire lump.	5,733	13.86	32.92	48.30	11.88	2.31	13.79	10,517	12,209	54
Sangamon.		Peerless mine.	Peerless.	482	6.90	32.92	48.30	11.88	2.31	12.77	11,780	12,652	11
Vermillion.		Pawnee mines.	Pawnee Nos. 1 and 2 washed nut.	5,786	7.93	34.23	49.78	8.06	1.79	8.76	12,215	13,267	11
Do.		do.	do.	6,292	12.59	34.23	49.78	8.06	1.79	11.55	9,751	11,155	378
Do.		do.	Pawnee-Himrod.	413	11.89	34.23	49.78	8.06	1.79	11.30	9,965	11,310	378
Do.		do.	do.	1,771	3.50	33.73	52.43	10.34	4.60	10.71	12,989	13,460	11
Kansas:		Cherokee.	Lump.	1,860	3.28	34.01	52.05	10.66	4.28	11.02	12,940	13,379	42
Cherokee and Crawford.		do.	Deep-shaft lump.	1,605	4.74	30.63	48.09	16.54	5.37	17.35	11,666	12,246	11
Do.		Englevale.	Cherokee.	1,645	8.30	33.03	44.46	14.21	3.76	15.50	11,211	12,228	50
Crawford.		do.	do.	1,323	4.21	33.03	44.46	14.21	3.76	11.91	12,709	13,268	378
Do.		do.	Fleming.	1,323	4.21	33.03	44.46	14.21	3.76	11.91	12,709	13,268	378

<sup>a</sup> Run of mine, unless otherwise specified.  
<sup>b</sup> Bulletin 378 of the U. S. Geol. Survey gives analyses made during the fiscal year 1908; Bulletin 11 of the Bureau of Mines is a reprint of U. S. Geol. Survey Bull. 428, and gives analyses made during the fiscal year 1909; page references opposite a blank in the adjoining column refer to pages of this bulletin.







## GOVERNMENT COAL PURCHASES.

TABLE 7.—*Bituminous coals sampled and analyzed during fiscal years 1908 to 1910, inclusive—Continued.*

State and county.		Where mined.		Commercial name of coal.	Tons delivered.	Proximate analysis "as received."						B. t. u.		Reference.	
State and county.	Bed.	Mine and location.	Bed.			Mine and location.	Mol- ture.	Volatile matter.	Fixed carbon.	Ash.	Sul- phur.	Ash in "dry coal."	"Dry coal."		Bul- letin No.
Pennsylvania—Con. Westmoreland				Youghio gheny screenings.	1,146	4.89	29.89	55.13	10.09	1.39	10.61	12,839	13,499	11	52
Virginia.				do.	914	4.44	32.01	55.26	8.29	1.38	8.67	13,251	13,867	.....	43
Tazewell	No. 3.	Big Vein Nos. 1 and 2 mines, Pocahontas.		Pocahontas.	13,668	3.03	20.30	71.43	5.24	.66	5.41	14,479	14,931	.....	48
West Virginia:				do.	255	2.79	17.65	75.34	4.22	.67	4.34	14,734	15,157	11	62
McDowell	Thin.	Oregon mine, near Welch		do.	1,760	2.36	18.56	71.70	7.38	.81	7.55	14,135	14,478	.....	90
Do.		Oregon, Cephus, and Welch mines.		do.	15,088	2.07	16.84	74.14	6.95	.68	7.10	14,350	14,653	11	56
McDowell and Mercer.				do.	335	3.08	17.56	74.79	4.57	.66	4.72	14,557	15,020	.....	55
Do.	No. 3.	Greenbrier or Louisville mine.		do.	407,376	2.63	18.25	73.87	5.25	.64	5.39	14,528	14,921	.....	48
Do.				do.	181,494	2.51					5.97	14,524	14,898	11	56
Fayette.	Sewell.	New River		New River	2,658	2.02					5.67	14,574	14,874	378	37
Do.				do.	2,391	2.22	20.07	73.90	3.81	.69	3.91	14,823	15,160	11	50
Do.				do.	2,200	2.14	21.34	71.79	4.73	1.01	4.83	14,576	14,895	.....	41
Do.				New River Adml- rally Smokeless.	3,850	2.34					4.47	14,635	14,985	.....	56
Do.	do.	Mines on Loup Creek		New River	6,703	2.22	21.94	70.92	4.92	.84	5.04	14,547	14,877	.....	67
Do.	do.	do.		do.	4,100	2.45					4.91	14,547	14,912	.....	63
Do.	do.	do.		do.	3,150	2.66					5.34	14,429	14,823	.....	66
Do.	do.	do.		New River nut and slack.	1,189	3.66					9.07	13,440	13,951	378	37
Do.	Powellton	Oakland mine.		Kanawha.	1,552	3.18	30.57	59.40	6.85	.92	7.07	13,849	14,304	.....	41
Do.		Elk Ridge mines Nos. 1 and 2, Armstrong Creek.		Kanawha gas.	197	3.19	30.21	59.94	6.66	.98	6.88	13,848	14,304	.....	41
Do.	do.	do.		do.	1,378	2.84	32.24	57.76	7.16	1.66	7.37	13,858	14,263	11	50
Kanawha.		Berlin and Oakley mines, Wake Forest and Eventon.		Kanawha.	162	3.14	32.82	55.37	8.67	2.36	8.96	13,422	13,857	11	51
Do.		do.		do.	6,836	2.06	22.06	71.60	4.28	.87	4.37	14,742	15,052	11	71
Fayette and Ral- eigh.	Sewell.	Loup and Piney Creeks.		New River.	958	3.12	20.50	71.95	4.43	.85	4.57	14,557	15,026	11	71
Do.	do.	do.		do.	278	2.79	22.06	70.09	5.06	.89	3.20	14,466	14,882	11	72
Do.	do.	do.		do.	4,480	3.09					6.62	14,153	14,635	.....	72
Do.	Sewell	Piney mine.		New River.	2,061	2.50	20.58	71.70	5.22	.74	5.35	14,533	14,905	11	49
Raleigh.	do.	do.		do.	115,871	2.77					4.84	14,570	14,985	11	53
Do.	Beckley	do.		do.	274	3.00					5.00	14,489	14,937	.....	66

TABLE 8.—Ash deductions for bituminous coals bought on double standard.

Ash as established in proposal.	No deduction for limits below—	Cents per ton to be deducted.							Maximum limits for ash.
		2	4	7	12	18	25	35	
		Percentages of ash in dry coal.							
<i>Per ct.</i>									
5	7 inclusive	7.01- 8.00	8.01- 9.00	9.01-10.00	10.01-11.00	11.01-12.00	12.01-13.00	13.01-14.00	12
6	8 do	8.01- 9.00	9.01-10.00	10.01-11.00	11.01-12.00	12.01-13.00	13.01-14.00	14.01-15.00	13
7	9 do	9.01-10.00	10.01-11.00	11.01-12.00	12.01-13.00	13.01-14.00	14.01-15.00	15.01-16.00	14
8	10 do	10.01-11.00	11.01-12.00	12.01-13.00	13.01-14.00	14.01-15.00	15.01-16.00	16.01-17.00	14
9	11 do	11.01-12.00	12.01-13.00	13.01-14.00	14.01-15.00	15.01-16.00	16.01-17.00	17.01-18.00	15
10	12 do	12.01-13.00	13.01-14.00	14.01-15.00	15.01-16.00	16.01-17.00	17.01-18.00		16
11	13 do	13.01-14.00	14.01-15.00	15.01-16.00	16.01-17.00	17.01-18.00	18.01-19.00		16
12	14 do	14.01-15.00	15.01-16.00	16.01-17.00	17.01-18.00	18.01-19.00	19.01-20.00		17
13	15 do	15.01-16.00	16.01-17.00	17.01-18.00	18.01-19.00	19.01-20.00	20.01-21.00		18
14	16 do	16.01-17.00	17.01-18.00	18.01-19.00	19.01-20.00	20.01-21.00	21.01-22.00		19
15	17 do	17.01-18.00	18.01-19.00	19.01-20.00	20.01-21.00	21.01-22.00			19
16	18 do	18.01-19.00	19.01-20.00	20.01-21.00	21.01-22.00	22.01-23.00			20
17	19 do	19.01-20.00	20.01-21.00	21.01-22.00	22.01-23.00				21
18	20 do	20.01-21.00	21.01-22.00	22.01-23.00					22

TABLE 9.—Analyses of coals delivered to the Government under contracts, 1909-10.

ALBANY, N. Y., CUSTOMHOUSE.

[Lackawanna bird's-eye anthracite, Scranton region, Pa.; 250 tons at \$2.40, 17 per cent ash, 12,000 B. t. u.]

Date.	Tons delivered.	Proximate analysis, "as received."					Ash "dry coal."	B. t. u.		Corrected price per ton.
		Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.		"As received."	"Dry coal."	
1910.										
January	89.0	4.00	7.00	73.10	15.90	0.70	16.55	12,025	12,525	\$2.4050
March	45.2	4.40	7.00	76.00	12.60	.65	13.20	12,130	12,680	2.4460
Total	134.20									
Average		4.14	7.00	74.07	14.79	.68	15.42	12,060	12,581	2.4220

ALBANY, N. Y., CUSTOMHOUSE.

[Clearfield run of mine, Ebed, Aetna slope mine, Portage, Pa.; 250 tons at \$3.44; 8 per cent ash, 14,000 B. t. u.]

Date.	Tons delivered.	Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.	Ash "dry coal."	"As received."	"Dry coal."	Corrected price per ton.
1910.										
January	96.0	1.45	19.75	71.30	7.50	1.65	7.65	14,340	14,560	\$3.5235
March	50.0	1.30	20.00	72.10	6.60	1.55	6.70	14,540	14,730	3.5827
April	48.1	1.50	19.50	72.20	6.80	1.95	6.90	14,370	14,580	3.5409
Total	194.100									
Average		1.42	19.75	71.74	7.09	1.70	7.19	14,399	14,606	3.5380

BALTIMORE, MD., APPRAISER'S STORES.

[Sugar Loaf run of mine, Miller bed, Sugar Loaf mines Nos. 2 and 3, Twin Rocks, Cambria County, Pa.; 120 tons at \$3.13; 5.50 per cent ash, 14,400 B. t. u.]

Date.	Tons delivered.	Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.	Ash "dry coal."	"As received."	"Dry coal."	Corrected price per ton.
1909.										
July	10.642	1.42	17.90	74.03	6.65	1.50	6.75	14,555	14,765	\$3.1637
September	10.217	1.90	18.50	74.10	5.50	.70	5.60	14,640	14,910	3.1821
November	12.214	1.30	19.00	72.10	7.60	1.85	7.70	14,250	14,440	3.0774
December	5.901	1.30	18.50	74.10	6.10	1.15	6.20	14,580	14,760	3.1691
1910.										
January	11.281	3.90	20.00	69.00	7.10	2.25	7.40	13,980	14,550	3.0387
February	11.267	1.50	18.00	74.90	5.60	1.00	5.70	14,610	14,830	3.1757
March	12.143	1.60	20.50	69.80	8.10	1.60	8.20	14,170	14,390	3.0600
May	11.406	2.20	23.50	64.70	9.60	.85	9.80	13,760	14,080	2.9209
Total	85.071									
Average		1.92	19.58	71.37	7.13	1.39	7.27	14,293	14,573	3.1067

TABLE 9.—Analyses of coals delivered to the Government under contracts, 1909-10—Con.

**BALTIMORE, MD., COURTHOUSE AND POST OFFICE.**

[Sugar Loaf run of mine, Miller bed, Sugar Loaf mines Nos. 2 and 3, Twin Rocks, Cambria County, Pa.; 2,250 tons at \$3.13; 5.50 per cent ash, 14,400 B. t. u.]

Date.	Tons delivered.	Proximate analysis, "as received."					Ash "dry coal."	B. t. u.		Corrected price per ton.
		Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.		"As received."	"Dry coal."	
1909.										
July.....	98.696	1.79	18.44	74.57	5.20	1.52	5.29	14,654	14,931	\$3.1852
August.....	140.432	1.80	21.31	70.68	6.21	1.67	6.33	14,524	14,790	3.1570
September.....	183.677	2.00	21.25	70.65	6.10	1.95	6.20	14,420	14,720	3.1343
October.....	148.789	1.80	20.00	71.95	6.25	1.88	6.35	14,430	14,690	3.1365
November.....	274.363	1.60	20.00	72.65	5.75	1.72	5.85	14,565	14,800	3.1659
December.....	182.240	1.75	20.50	70.25	7.50	2.05	7.70	14,215	14,475	3.0698
1910.										
January.....	394.394	3.45	20.50	69.85	6.20	1.88	6.45	14,200	14,705	3.0865
February.....	205.508	2.45	20.75	70.70	6.10	1.58	6.25	14,410	14,770	3.1322
March.....	227.561	1.60	20.75	70.95	6.70	1.95	6.80	14,370	14,605	3.1235
June.....	138.815	1.85	20.50	70.85	6.80	2.33	6.95	14,310	14,580	3.1104
Total.....	1,994.475									
Average.....		2.16	20.47	71.08	6.29	1.86	6.42	14,383	14,701	3.1263

**BALTIMORE, MD., CUSTOMHOUSE.**

[Anthracite screenings; 500 tons, at \$2.28; 16 per cent ash, 11,500 B. t. u.]

1909.										
September.....	18.580	6.10	8.00	72.10	13.80	1.45	14.70	11,840	12,610	\$2.3574
October.....	22.830	3.50	8.50	74.80	13.20	.75	13.70	12,490	12,940	2.4963
November.....	27.084	5.40	7.00	75.60	12.00	.85	12.70	12,350	13,050	2.4785
December.....	54.097	5.60	7.50	68.60	18.30	.70	19.30	11,320	11,980	2.2043
1910.										
January.....	73.402	8.40	7.50	71.20	12.90	.70	14.10	11,810	12,890	2.3515
February.....	63.640	6.55	6.00	74.70	12.75	.58	13.60	11,950	12,795	2.3892
March.....	36.733	4.00	7.00	75.60	13.40	.75	14.00	12,410	12,930	2.4804
May.....	13.955	4.05	8.50	75.35	12.10	.78	12.55	12,805	13,205	2.5687
Total.....	310.321									
Average.....		6.06	7.24	72.87	13.83	.75	14.72	11,968	12,740	2.3828

**BALTIMORE, MD., CUSTOMHOUSE.**

[Sugar Loaf run of mine, Miller bed, Sugar Loaf mines Nos. 2 and 3, Twin Rocks, Cambria County, Pa.; 300 tons, at \$3.13; 5.50 per cent ash, 14,400 B. t. u.]

1909.										
October.....	29.337	1.40	20.50	71.90	6.20	2.10	6.30	14,400	14,600	\$3.1300
November.....	30.194	1.70	18.50	74.20	5.60	1.45	5.70	14,570	14,820	3.1670
December.....	28.325	1.00	18.50	74.20	6.30	1.35	6.40	14,530	14,670	3.1583
1910.										
January.....	44.750	2.20	20.00	71.60	6.20	2.10	6.40	14,450	14,780	3.1409
February.....	43.544	1.70	20.50	70.60	7.20	2.25	7.30	14,350	14,610	3.1191
March.....	14.223	1.10	20.00	66.90	12.00	1.20	12.20	13,570	13,730	2.7696
April.....	37.370	1.40	19.00	69.60	10.00	3.50	10.20	13,790	13,980	2.9274
Total.....	227.743									
Average.....		1.59	19.61	71.49	7.31	2.12	7.43	14,287	14,518	3.1054

RESULTS OF ANALYSES.

TABLE 9.—Analyses of coals delivered to the Government under contracts, 1909-10—Con

**BOSTON, MASS., POST OFFICE AND SUBTREASURY.**

[Philadelphia & Reading anthracite screenings, Lehigh district, Wilkes-Barre, Pa.; 3,000 tons, at \$2.80; 8 per cent ash, 12,650 B. t. u.]

Date.	Tons delivered.	Proximate analysis, "as received."					Ash "dry coal."	B. t. u.		Corrected price per ton.
		Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.		"As received."	"Dry coal."	
<b>1909.</b>										
July.....	266.861	4.40	6.64	76.03	12.93	0.84	13.53	12,247	12,812	\$2.7508
August.....	112.508	5.20	4.95	79.70	10.15	.60	10.70	12,490	13,180	2.8346
September.....	116.236	4.70	5.75	79.00	10.55	.60	11.10	12,545	13,160	2.8368
October.....	317.979	3.15	5.75	79.35	11.75	.75	12.20	12,540	13,040	2.8257
November.....	168.615	4.05	5.00	80.30	10.65	.72	11.05	12,695	13,220	2.8700
December.....	219.173	4.25	5.75	79.25	10.75	.73	11.25	12,645	13,205	2.8589
<b>1910.</b>										
January.....	325.658	5.55	6.00	77.75	10.70	.73	11.30	12,605	13,350	2.8500
February.....	101.852	3.40	5.00	81.00	10.60	.68	10.95	12,805	13,250	2.9043
March.....	257.134	3.70	6.25	79.95	10.10	.75	10.50	12,905	13,400	2.9264
April.....	261.753	2.70	5.25	83.65	8.40	.65	8.60	13,435	13,810	3.0638
May.....	225.504	3.85	6.75	79.65	9.75	.55	10.15	13,020	13,540	2.9519
June.....	222.133	5.50	7.00	74.40	13.10	.65	13.90	11,840	12,525	2.6607
Total.....	2,595.406									
Average.....		4.17	5.95	79.02	10.86	.70	11.33	12,654	13,205	2.8609

**BOSTON, MASS., POST OFFICE AND SUBTREASURY.**

[Pocahontas and New River run of mine, W. Va.; 1,500 tons, at \$3.82; 6 per cent ash, 14,350 B. t. u.]

<b>1909.</b>										
July.....	142.638	1.63	19.36	73.80	5.21	0.80	5.30	14,702	14,952	\$3.9153
August.....	71.705	3.80	17.95	72.10	6.15	.65	6.35	14,215	14,775	3.7841
September.....	115.227	3.10	20.75	71.15	5.00	.68	5.10	14,465	14,920	3.8506
October.....	97.941	1.20	18.00	75.55	5.25	.73	5.35	14,585	14,855	3.8826
November.....	138.455	2.50	17.50	74.60	5.40	.62	5.50	14,480	14,805	3.8546
December.....	149.642	2.40	19.25	72.85	5.50	.55	5.65	14,550	14,910	3.8732
<b>1910.</b>										
January.....	163.526	7.10	16.50	71.10	5.30	.55	5.70	13,835	14,890	3.6829
February.....	99.853	4.35	17.00	72.95	5.70	.65	5.90	14,145	14,790	3.7654
March.....	121.678	2.40	17.00	74.50	6.10	.78	6.30	14,425	14,780	3.8400
April.....	179.691	2.75	20.00	66.80	10.45	.63	10.70	13,490	13,865	3.5211
May.....	102.688	2.45	17.25	74.95	5.35	.60	5.55	14,490	14,855	3.8573
June.....	103.375	3.60	17.25	72.85	6.30	.98	6.60	14,140	14,665	3.7641
Total.....	1,486.419									
Average.....		3.16	18.24	72.48	6.12	.68	6.32	14,261	14,726	3.7963

**BROOKLYN, N. Y., COURTHOUSE AND POST OFFICE.**

[No. 2 buckwheat anthracite, Pittston mines, Luzerne County, Pa.; 5,000 tons, at \$3.15; 18 per cent ash, 11,150 B. t. u.]

<b>1909.</b>										
July.....	383.900	5.27	6.84	66.18	21.71	0.87	22.91	10,630	11,222	\$2.9331
August.....	346.826	5.55	6.75	69.30	18.40	.83	19.50	11,240	11,900	3.1754
September.....	427.411	6.20	7.00	69.05	17.75	1.18	18.95	11,105	11,855	3.1373
October.....	376.384	5.25	6.50	73.00	15.25	1.03	16.10	11,670	12,315	3.3069
November.....	352.416	5.95	7.50	71.00	15.55	1.22	16.55	11,570	12,305	3.2787
December.....	409.192	5.40	6.75	68.30	19.55	1.10	20.65	11,040	11,722	3.0989
<b>1910.</b>										
January.....	277.904	8.10	5.75	69.85	16.30	.93	17.75	11,260	12,260	3.1811
February.....	442.645	6.30	6.75	71.35	15.60	.68	16.65	11,515	12,290	3.2631
March.....	474.578	6.35	6.50	70.85	16.30	.95	17.40	11,480	12,255	3.2432
April.....	307.705	5.70	6.25	73.60	14.45	.73	15.35	11,710	12,420	3.3282
May.....	447.300	5.50	6.75	70.90	16.85	.78	17.85	11,350	12,010	3.2065
June.....	423.641	6.05	7.00	73.25	13.70	1.13	14.55	11,755	12,512	3.3509
Total.....	4,669.902									
Average.....		5.93	6.72	70.55	16.80	.95	17.86	11,359	12,075	3.2090

TABLE 9.—Analyses of coals delivered to the Government under contracts, 1909-10—Con.

## BUFFALO, N. Y., POST OFFICE.

[Shawmut  $\frac{3}{4}$ " lump, through 1 $\frac{1}{2}$ " and over  $\frac{3}{4}$ " bar screen, Lower Freeport bed, Shawmut mines, Elk and Jefferson Counties, Pa.; 1,000 tons at \$2.84; 5 per cent ash, 14,100 B. t. u.]

Date.	Tons delivered.	Proximate analysis, "as received."					Ash "dry coal."	B. t. u.		Corrected price per ton.
		Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.		"As received."	"Dry coal."	
1909.										
October.....	83.973	2.40	35.00	56.05	6.55	1.48	6.70	13,865	14,205	\$2.7927
November.....	103.035	4.15	33.00	55.70	7.15	1.70	7.45	13,450	14,035	2.6891
December.....	175.759	4.05	32.50	53.75	9.70	2.23	10.10	13,045	13,595	2.5075
1910.										
January.....	169.777	6.30	31.50	54.25	7.95	1.73	8.50	13,090	13,975	2.5966
February.....	164.285	4.20	33.50	53.10	9.20	1.55	9.55	13,255	13,835	2.5998
March.....	129.107	2.50	32.25	52.65	12.60	1.95	12.95	13,010	13,345	2.3705
April.....	91.339	4.80	32.50	53.40	9.30	1.65	9.80	13,100	13,765	2.5686
May.....	55.848	1.90	33.50	54.40	10.20	2.88	10.40	13,315	13,575	2.5619
June.....	22.500	3.15	31.50	53.35	12.00	2.05	12.40	12,855	13,270	2.3392
Total.....	995.623									
Average.....		4.06	32.76	53.97	9.21	1.86	9.60	13,210	13,769	2.5907

## CHICAGO, ILL., APPRAISER'S STORES.

[Pana Nos. 1 and 2 washed nut, through 3" and over 1 $\frac{1}{2}$ " screen, No. 6 bed, Pana, Ill.; 500 tons at \$3.04; 8.90 per cent ash, 12,136 B. t. u.]

1909.										
July.....	25.257	11.32	35.83	41.60	11.25	3.30	12.69	10,861	12,247	\$2.6806
August.....	56.618	11.10	38.00	41.80	9.10	3.50	10.30	11,310	12,720	2.8331
September.....	22.679	8.90	33.00	47.70	10.40	2.00	11.40	11,740	12,880	2.9208
October.....	58.873	8.20	33.00	47.90	10.90	1.60	11.80	11,570	12,610	2.8782
November.....	46.272	6.50	35.00	48.90	9.60	1.70	10.30	12,100	12,950	3.0310
December.....	101.696	5.64	34.02	48.66	11.68	2.35	12.38	12,044	12,763	2.9770
1910.										
January.....	68.326	4.90	33.22	50.54	11.34	2.37	11.94	12,271	12,903	3.0338
February.....	48.761	5.25	35.50	49.80	9.45	2.20	10.00	12,470	13,160	3.1237
March.....	69.520	5.33	33.17	49.06	12.44	2.27	13.18	12,030	12,706	2.9434
April.....	26.708	5.85	33.75	47.45	12.95	2.30	13.75	11,850	12,590	2.8984
May.....	39.475	5.65	33.75	48.50	12.10	2.75	12.80	11,920	12,635	2.9459
Total.....	564.185									
Average.....		6.76	34.33	47.86	11.05	2.37	11.85	11,907	12,770	2.9626

## CHICAGO, ILL., COURTHOUSE AND POST OFFICE.

[Pana Nos. 1 and 2 washed nut, through 3" and over 1 $\frac{1}{2}$ " screen, No. 6 bed, Pana, Ill.; 8,000 tons at \$3.04; 8.90 per cent ash, 12,136 B. t. u.]

1909.										
July.....	279.107	10.55	37.59	41.66	10.20	3.26	11.40	11,153	12,470	\$2.7738
August.....	172.467	10.77	38.64	41.35	9.24	3.35	10.35	11,332	12,699	2.8386
September.....	150.569	10.00	38.25	42.45	9.30	3.55	10.40	11,390	12,655	2.8531
October.....	174.386	10.45	36.50	43.50	9.55	2.23	10.65	11,375	12,705	2.8494
November.....	228.471	6.10	34.75	45.80	9.70	2.28	10.70	11,745	12,950	2.9421
December.....	424.754	8.25	33.25	48.40	10.10	1.73	11.05	11,770	12,835	2.9283
January.....	238.036	7.70	34.70	48.16	9.44	2.11	10.22	11,948	12,944	2.9929
February.....	288.214	7.37	33.23	49.02	10.38	1.69	11.21	12,028	12,982	2.9929
March.....	377.824	7.16	34.40	48.77	9.67	1.71	10.38	12,130	13,065	3.0355
April.....	494.359	6.63	34.70	49.38	9.29	2.21	9.86	12,270	13,141	3.0736
1910.										
January.....	389.989	6.40	34.56	49.08	9.96	2.36	10.65	12,208	13,043	3.0580
February.....	335.522	6.14	34.43	49.90	9.53	2.31	10.16	12,346	13,154	3.0926
March.....	343.594	5.71	34.64	49.78	9.87	2.21	10.46	12,397	13,148	3.1054
April.....	308.415	5.33	34.83	50.56	9.28	2.29	9.82	12,507	13,211	3.1329
May.....	329.353	5.18	34.42	51.35	9.05	2.33	9.50	12,596	13,284	3.1552
June.....	370.770	5.63	34.86	51.69	7.82	1.87	8.28	12,879	13,647	3.2261
July.....	244.888	5.20	34.90	50.00	9.90	2.59	10.44	12,452	13,135	3.1192
August.....	201.908	7.15	34.00	51.22	7.63	1.43	8.23	12,480	13,441	3.1262
September.....	101.663	6.05	34.50	50.90	8.55	.80	9.10	12,560	13,370	3.1462
October.....	102.533	5.75	34.51	50.74	9.00	2.20	9.55	12,465	13,225	3.1224
November.....	153.404	6.33	33.83	51.61	8.23	1.95	8.80	12,400	13,238	3.1061
December.....	179.632	8.20	37.93	45.49	8.38	2.51	9.15	12,114	13,196	3.0345
Total.....	6,064.958									
Average.....		7.08	34.94	48.60	9.38	2.19	10.10	12,151	13,076	3.0438

TABLE 9.—Analyses of coals delivered to the Government under contracts, 1909-10—Con.

## CINCINNATI, OHIO, CUSTOMHOUSE.

[New River Admiralty Smokeless, run of mine, Sewell bed, mines on Loup Creek branch and main line of Chesapeake & Ohio R. R., Fayette County, W. Va.; 3,000 tons at \$2.58; 5 per cent ash, 14,900 B. t. u.]

Date.	Tons delivered.	Proximate analysis, "as received."					Ash "dry coal."	B. t. u.		Corrected price per ton.
		Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.		"As received."	"Dry coal."	
1909.										
July.....	452.127	1.59	20.85	73.15	4.41	1.06	4.49	14,717	14,954	\$2.5483
August.....	96.189	1.70	21.00	72.95	4.35	1.20	4.45	14,685	14,940	2.5428
September.....	146.569	1.70	20.50	73.40	4.40	1.13	4.50	14,740	15,000	2.5523
October.....	225.025	1.80	23.00	71.05	4.15	.95	4.25	14,660	14,920	2.5384
November.....	204.234	1.75	22.75	71.60	3.90	.73	4.00	14,740	14,995	2.5622
December.....	44.540	2.00	21.00	71.20	5.80	.90	5.90	14,410	14,700	2.4952
1910.										
January.....	148.363	4.05	20.00	71.20	4.75	1.15	4.95	14,330	14,940	2.4813
February.....	324.694	3.15	20.50	71.60	4.75	.83	4.85	14,435	14,910	2.4995
March.....	537.170	2.00	21.75	70.65	5.60	1.08	5.75	14,465	14,765	2.5047
April.....	21.167	1.50	20.25	72.80	5.45	.75	5.55	14,540	14,755	2.5177
Total.....	2,200.078									
Average.....		2.14	21.34	71.79	4.73	1.01	4.83	14,576	14,895	2.5239

## DENVER, COLO., MINT BUILDING.

[Green Cañon, run of mine, Green Cañon mines, Las Animas County, Colo.; 1,500 tons at \$4.40; 12 per cent ash, 13,000 B. t. u.]

1909.										
October.....	45.817	3.20	36.50	50.30	10.00	.60	10.40	12,880	13,300	\$4.3694
November.....	158.991	5.80	36.50	46.30	11.40	.85	12.10	12,240	12,990	4.1428
December.....	52.969	5.30	35.00	49.20	10.50	.70	11.10	12,430	13,120	4.2071
	91.823	5.70	36.00	47.10	11.20	.70	11.80	12,220	12,960	4.1360
1910.										
January.....	69.239	3.60	35.50	46.80	14.10	.80	14.70	12,020	12,460	4.0483
	181.741	3.70	34.50	48.50	13.30	.65	13.80	12,330	12,790	4.1732
	52.643	2.60	36.00	46.20	15.20	1.00	15.60	12,010	12,330	4.0249
February.....	120.308	3.40	35.00	48.60	13.00	.65	13.50	12,380	12,820	4.1902
March.....	122.449	2.80	36.00	49.80	11.40	.80	11.70	12,580	12,950	4.2578
April.....	187.993	3.40	35.00	48.40	13.20	.70	13.70	12,320	12,760	4.1698
May.....	196.500	3.20	35.50	47.40	13.90	.75	14.40	12,250	12,660	4.1262
Total.....	1,280.473									
Average.....		3.87	35.48	47.98	12.67	.72	13.18	12,320	12,816	4.1698

## DETROIT, MICH., COURTHOUSE AND POST OFFICE.

[Kanawha gas, run of mine, Powellton bed, Elk Ridge Nos. 1 and 2 mines, Armstrong Creek, W. Va.; 1,400 tons at \$2.90; 5 per cent ash, 14,360 B. t. u.]

1909.										
July.....	155.375	2.20	32.46	59.30	6.04	1.10	6.17	13,999	14,313	\$2.8271
August.....	72.554	4.00	32.25	58.40	5.35	1.00	5.55	13,665	14,235	2.7596
September.....	37.696	2.20	31.50	70.90	5.40	.85	5.50	14,100	14,420	2.8475
October.....	108.679	2.30	32.50	59.90	5.30	.70	5.40	14,210	14,540	2.8697
November.....	103.643	2.50	32.00	60.60	4.90	.70	5.10	14,270	14,630	2.8818
December.....	194.616	2.70	32.50	57.90	6.90	1.25	7.10	13,830	14,210	2.7730
1910.										
January.....	221.922	4.20	26.50	62.10	7.20	.65	7.50	13,800	14,410	2.7669
February.....	196.741	4.10	31.50	58.50	5.90	1.00	6.20	14,250	14,850	2.8778
March.....	192.482	3.60	29.50	58.70	8.20	.65	8.50	13,560	14,060	2.6984
April.....	78.268	2.00	30.50	58.40	9.10	.65	9.30	13,450	13,720	2.6462
May.....	92.929	4.00	31.00	56.10	8.90	1.20	9.20	13,210	13,760	2.5978
June.....	97.121	2.30	31.50	58.00	8.20	1.30	8.40	13,640	13,950	2.7146
Total.....	1,552.026									
Average.....		3.18	30.57	59.40	6.85	.92	7.07	13,849	14,304	2.7768

TABLE 9.—Analyses of coals delivered to the Government under contracts, 1909–10—Con.

## DETROIT, MICH., CUSTOMHOUSE.

[Kanawha gas, run of mine, Powellton bed, Elk Ridge Nos. 1 and 2 mines, Armstrong Creek, W. Va.; 200 tons at \$2.90; 5 per cent ash, 14,360 B. t. u.]

Date.	Tons delivered.	Proximate analysis, "as received."					Ash "dry coal."	B. t. u.		Corrected price per ton.
		Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.		"As received."	"Dry coal."	
1909.										
September.....	44.268	2.00	32.50	59.90	5.60	0.65	5.70	14,310	14,580	\$2.8899
December.....	18.857	3.00	32.50	60.00	4.50	.75	4.60	14,210	14,650	2.8697
	24.357	4.90	31.00	57.00	7.10	1.80	7.50	13,250	13,930	2.6558
1910.										
January.....	28.616	4.80	24.50	64.00	6.70	.75	7.00	13,760	14,450	2.7788
February.....	32.362	3.70	28.50	59.90	7.90	1.15	8.20	13,600	14,120	2.7065
March.....	25.156	1.90	30.50	61.20	6.40	.75	6.50	14,080	14,360	2.8435
April.....	11.464	2.90	31.00	59.50	6.60	.70	6.80	13,750	14,160	2.7768
May.....	7.813	2.10	34.00	54.00	9.90	1.65	10.10	13,310	13,590	2.5680
June.....	4.352	2.60	33.00	53.50	10.90	1.85	11.20	13,140	13,480	2.4736
Total.....	197.245									
Average.....		3.19	30.21	59.94	6.66	.98	6.88	13,848	14,304	2.7966

## KANSAS CITY, MO., COURTHOUSE AND POST OFFICE.

[Deep-shaft lump, over 1½" round-opening screen, Cherokee bed, Cherokee and Crawford Counties, Kans.; 2,000 tons at \$3.85; 11.5 per cent ash, 12,900 B. t. u.]

1909.										
July.....	98.143	3.29	34.57	54.03	8.11	3.63	8.38	13,501	13,960	\$4.0594
August.....	91.446	3.20	34.50	54.60	7.70	2.60	7.90	13,490	13,930	4.0561
September.....	139.701	3.75	34.25	53.40	8.60	3.83	8.95	13,205	13,725	3.9610
October.....	112.522	3.50	34.25	53.00	9.25	3.98	9.55	13,165	13,640	3.9391
November.....	160.228	3.30	33.50	51.50	11.70	4.90	12.10	12,745	13,180	3.8037
December.....	249.038	3.20	33.75	50.45	12.60	6.08	13.00	12,520	12,935	3.7366
1910.										
January.....	240.830	2.75	32.25	49.55	15.45	5.00	15.90	12,210	12,550	3.5741
February.....	146.888	3.55	34.00	52.70	9.75	3.13	10.15	13,045	13,545	3.9033
March.....	172.429	3.05	34.25	54.65	8.05	2.13	8.30	13,530	13,955	4.0680
April.....	147.607	3.45	34.75	51.10	10.70	4.20	11.15	12,905	13,365	3.8515
May.....	121.063	3.40	34.25	52.25	10.10	4.30	10.45	13,045	13,500	3.9033
June.....	180.357	3.40	35.25	51.75	9.60	5.08	9.90	13,045	13,504	3.9033
Total.....	1,860.252									
Average.....		3.28	34.01	52.05	10.66	4.28	11.02	12,940	13,379	3.8619

## LOUISVILLE, KY., COURTHOUSE AND POST OFFICE.

[Slack and nut, through 1½" bar screen, Pittsburg bed, Pike mine, Brownsville Junction, on the Monongahela River, 50 miles from Pittsburgh; 1,850 tons at \$2.12; 11 per cent ash, 13,000 B. t. u.]

1909.										
July.....	109.658	3.59	30.95	54.24	11.22	1.43	11.63	12,882	13,361	\$2.1008
August.....	138.450	2.45	31.15	56.15	10.25	1.23	10.45	13,285	13,615	2.1665
September.....	101.955	3.30	31.25	56.65	8.80	1.58	9.10	13,355	13,815	2.1879
October.....	138.325	2.50	31.00	56.25	10.25	1.50	10.50	13,125	13,465	2.1404
November.....	112.022	3.35	31.00	57.25	8.40	1.30	8.70	13,385	13,855	2.2028
December.....	170.863	3.15	31.75	52.35	12.75	1.53	13.15	12,500	12,900	2.0185
1910.										
January.....	191.767	5.35	31.50	54.05	9.10	1.53	9.55	13,100	13,840	2.1463
February.....	163.548	4.40	31.00	53.85	10.75	1.20	11.25	12,870	13,465	2.0988
March.....	123.406	2.50	30.00	55.15	12.35	1.13	12.70	12,815	13,140	2.0898
April.....	140.8097	4.15	30.50	53.35	12.00	1.13	12.50	12,745	13,295	2.0784
May.....	112.8989	3.05	31.25	54.15	11.55	1.08	11.95	12,775	13,175	2.0833
June.....	114.887	4.25	30.25	53.10	12.40	1.25	12.95	12,535	13,091	2.0442
Total.....	1,618.5896									
Average.....		3.59	31.01	54.57	10.83	1.33	11.23	12,937	13,419	2.1097



TABLE 9.—*Analyses of coals delivered to the Government under contracts, 1909-10—(Con.)***MILWAUKEE, WIS., COURTHOUSE AND POST OFFICE.**

[Youghiogeny screenings, through 1-inch square opening screen, Youghiogeny district, Pa.; 1,400 tons at \$3.05; 5.21 per cent ash, 14,170 B. t. u.]

Date.	Tons delivered.	Proximate analysis, "as received."					Ash "dry coal."	B. t. u.		Corrected price per ton.
		Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.		"As received."	"Dry coal."	
<b>1909.</b>										
July.....	189.000	2.39	32.82	56.18	8.61	1.52	8.82	13,550	13,882	\$2.8765
August.....	141.000	2.60	32.10	55.80	9.50	1.15	9.75	13,355	13,710	2.8046
October.....	75.000	3.00	32.75	57.10	7.15	1.25	7.35	13,690	14,110	2.9267
December.....	73.000	3.55	32.50	55.60	8.35	1.33	8.65	13,265	13,780	2.8152
<b>1910.</b>										
January.....	58.851	5.30	31.50	55.30	7.90	1.30	8.30	13,150	13,880	2.7905
	72.577	9.90	29.75	52.10	8.25	1.83	9.15	12,495	13,860	2.6495
February.....	117.188	7.85	31.00	53.40	7.75	1.30	8.45	12,850	13,945	2.7259
	61.686	6.00	31.25	55.60	7.15	1.08	7.55	13,125	13,970	2.8051
April.....	39.829	4.30	32.00	55.30	8.40	1.40	8.80	13,300	13,900	2.8227
May.....	86.000	3.00	33.25	55.40	8.35	1.55	8.65	13,355	13,770	2.8346
Total.....	914.131									
Average.....		4.44	32.01	55.26	8.29	1.38	8.67	13,251	13,867	2.8122

**MINNEAPOLIS, MINN., POST OFFICE.**

[Westmoreland-Youghiogeny, Thin Vein lump, over 3/4-inch bar screen, second pool, Schoenberger and Hazelkirk mines, Westmoreland County, Pa.; 600 tons at \$5; 6 per cent ash, 14,200 B. t. u.]

<b>1909.</b>										
July.....	74.000	1.54	36.70	56.66	5.10	1.11	5.18	14,303	14,527	\$5.0363
November.....	72.000	2.80	34.50	55.90	6.80	1.50	7.00	13,810	14,200	4.8627
December.....	79.000	1.70	34.50	56.70	7.10	1.00	7.20	13,890	14,120	4.8909
<b>1910.</b>										
January.....	71.000	1.65	36.50	54.10	7.75	1.30	7.85	13,820	14,050	4.8662
February.....	52.000	1.70	36.50	55.80	6.00	1.70	6.10	14,100	14,340	4.9648
March.....	102.000	1.60	35.00	56.80	6.60	1.08	6.70	14,055	14,280	4.9489
Total.....	450.000									
Average.....		1.82	35.52	56.07	6.59	1.24	6.70	13,996	14,255	4.9282

**NEW ORLEANS, LA., CUSTOMHOUSE.**

[Pratt lump, over 1 1/2 to 2 1/2 inch round openings, Pratt bed, Pratt mines, Pratt City, Ala.; 1,450 tons at \$3.25; 6 per cent ash, 14,500 B. t. u.]

<b>1909.</b>										
July.....	118.763	1.12	29.99	62.69	6.20	.99	6.27	14,293	14,454	\$3.2026
August.....	95.513	1.10	30.90	62.10	6.80	1.70	6.90	14,300	14,460	3.2052
September.....	93.116	1.10	29.50	62.20	7.20	1.33	7.25	14,175	14,350	3.1772
October.....	102.339	1.00	30.00	63.95	5.05	1.28	5.05	14,580	14,725	3.2679
November.....	89.369	1.10	29.75	62.60	6.55	1.25	6.65	14,390	14,555	3.2253
December.....	137.156	1.20	30.50	61.05	7.25	1.70	7.35	14,165	14,335	3.1749
<b>1910.</b>										
January.....	110.866	.90	29.25	61.45	8.40	2.10	8.50	14,010	14,130	3.1202
February.....	115.759	1.25	28.50	58.75	11.50	1.68	11.60	13,500	13,665	2.9059
March.....	107.071	.95	28.75	61.30	9.00	1.50	9.05	13,950	14,085	3.0867
April.....	103.067	.95	29.00	62.35	7.70	1.55	7.80	14,215	14,345	3.1861
May.....	101.362	.95	29.00	62.25	7.80	1.68	7.85	14,135	14,270	3.1682
June.....	105.239	1.15	24.25	66.50	8.10	1.10	8.25	14,040	14,203	3.1269
Total.....	1,279.620									
Average.....		1.07	29.06	62.20	7.67	1.50	7.75	14,137	14,289	3.1686

## GOVERNMENT COAL PURCHASES.

TABLE 9.—Analyses of coals delivered to the Government under contracts, 1909–10—Con.

## NEW ORLEANS, LA., MINT BUILDING.

[Pratt lump, over 1½ to 2½ inch round openings, Pratt mines, Pratt City, Ala.; 800 tons at \$3.25; 6 per cent ash, 14,500 B. t. u.]

Date.	Tons delivered.	Proximate analysis, "as received."					Ash "dry coal."	B. t. u.		Corrected price per ton.
		Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.		"As received."	"Dry coal."	
1909. October, November, December.....	54,574	1.05	29.25	61.55	8.15	1.63	8.25	14,080	14,235	\$3.1359
1910. January.....	60.344	1.60	28.75	64.25	5.40	1.53	5.50	14,565	14,800	3.2646
February, March.....	33.527	1.00	29.25	64.20	5.55	1.45	5.65	14,620	14,760	3.2769
Total.....	148.445									
Average.....		1.26	29.05	63.24	6.45	1.55	6.55	14,399	14,583	3.2274

## NEWPORT, R. I., NAVAL TRAINING SCHOOL.

[Atlantic Quemahoning run of mine, C' bed, Atlantic mine, Boswell, Pa.; 10,000 tons at \$3.55; 7 per cent ash, 0.65 per cent sulphur; 14,500 B. t. u.]

1909. July.....	739	2.08	18.42	71.87	7.63	.73	7.79	14,125	14,425	\$3.4582
September.....	700	2.90	19.00	71.20	6.90	1.10	7.30	14,250	14,670	3.4888
October.....	800	3.30	16.50	71.20	9.00	1.00	9.30	13,820	14,290	3.3635
December.....	700	1.80	16.50	71.40	10.30	.75	10.40	13,770	14,030	3.3313
1910. January.....	800	3.80	16.50	70.36	9.34	.88	9.70	13,563	14,099	3.3006
February.....	850	3.30	16.17	70.86	9.67	.92	10.00	13,607	14,071	3.2914
March.....	775	2.94	17.25	70.41	9.40	.81	9.69	13,719	14,135	3.3388
400	2.23	16.13	70.94	10.70	1.03	10.93	13,700	14,012	3.3141	
Total.....	6,489									
Average.....		2.80	16.81	71.43	8.94	.88	9.20	13,834	14,233	3.3669

## NEW YORK, N. Y., APPRAISER'S WAREHOUSE.

[Anthracite screenings, Pennsylvania; 2,500 tons at \$2.60; 17 per cent ash, 12,000 B. t. u.]

1909. July.....	198,317	5.23	6.92	73.21	14.64	1.05	15.45	11,683	12,328	\$2.5413
1910. February.....	221,306	5.15	6.50	75.95	12.40	1.03	13.05	12,365	13,035	2.7091
March.....	234,674	5.35	5.50	75.25	13.90	1.98	14.65	12,130	12,820	2.6482
April.....	28,018	6.40	5.00	78.10	10.50	.70	11.30	12,520	13,380	2.7627
May.....	252,464	5.60	5.25	76.70	12.45	.75	13.20	12,255	12,985	2.6853
June.....	226,904	4.95	4.50	78.60	11.95	.68	12.60	12,330	12,970	2.7115
Total.....	1,161,683									
Average.....		5.29	5.67	76.08	12.96	.89	13.68	12,174	12,854	2.6677

TABLE 9.—Analyses of coals delivered to the Government under contracts, 1909–10—Con.

## NEW YORK, N. Y., APPRAISER'S WAREHOUSE.

[Delta run of mine, Delta mines, Cambria County, Pa.; 2,500 tons at \$3.35; 6 per cent ash, 14,000 B. t. u.]

Date.	Tons delivered.	Proximate analysis, "as received."					Ash "dry coal."	B. t. u.		Corrected price per ton.
		Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.		"As received."	"Dry coal."	
<b>1909.</b>										
July.....	265.424	1.73	20.57	70.97	6.73	1.89	6.85	14,353	14,606	\$3.4345
August.....	227.000	1.80	23.50	66.70	8.00	1.75	8.10	14,125	14,380	3.3599
September.....	191.875	2.30	20.75	69.10	7.85	2.28	8.05	14,020	14,350	3.3348
October.....	254.962	2.10	23.00	66.20	8.70	2.50	8.85	13,825	14,115	3.2881
November.....	483.154	1.95	21.25	68.60	8.20	2.08	8.35	14,040	14,310	3.3396
December.....	250.692	3.50	21.25	68.05	7.20	1.95	7.50	13,845	14,340	3.3129
<b>1910.</b>										
January.....	425.982	4.25	20.75	66.55	8.45	2.25	8.85	13,640	14,240	3.2439
February.....	518.301	2.80	21.25	67.15	8.80	2.68	9.00	13,790	14,195	3.2798
March.....	237.438	1.95	20.50	68.40	9.15	.80	9.35	13,950	14,230	3.2980
Total.....	2,854.828									
Average.....		2.59	21.35	67.85	8.21	2.44	8.42	13,926	14,296	3.3123

## NEW YORK, N. Y., APPRAISER'S WAREHOUSE.

[Consolidation run of mine; 500 tons at \$3.40; 6 per cent ash, 14,000 B. t. u.]

<b>1910.</b>										
April.....	206.107	1.90	20.75	69.00	8.35	1.53	8.50	14,105	14,380	\$3.4055
June.....	271.277	3.20	18.25	70.00	8.55	1.18	8.85	13,735	14,190	3.3156
Total.....	477.384									
Average.....		2.64	19.33	69.57	8.46	1.33	8.70	13,895	14,272	3.3545

## NEW YORK, N. Y., BARGE OFFICE.

[Pittston, pea anthracite, Pittston mines, Luzerne County, Pa.; 500 tons at \$4.30; 14 per cent ash, 12,190 B. t. u.]

<b>1909.</b>										
October.....	78.341	4.95	5.50	73.65	15.90	1.08	16.75	11,735	12,345	\$4.1195
December.....	179.528	3.20	6.25	74.30	16.25	.83	16.75	12,015	12,410	4.2183
<b>1910.</b>										
February.....	163.802	3.45	5.50	72.30	18.75	.68	19.40	11,590	11,995	3.9684
Total.....	421.671									
Average.....		3.62	5.82	73.40	17.16	.82	17.80	11,798	12,244	4.1217

TABLE 9.—Analyses of coals delivered to the Government under contracts, 1909-10—Con.

## NEW YORK, N. Y., COURTHOUSE AND POST OFFICE.

[Delta run of mine, Delta mines, Cambria County, Pa.; 11,000 tons at \$3.37; 6 per cent ash, 14,000 B. t. u.]

Date.	Tons delivered.	Proximate analysis, "as received."					Ash "dry coal."	B. t. u.		Corrected price per ton.
		Moisture.	Volat- ile matter.	Fixed carbon.	Ash.	Sulphur.		"As received."	"Dry coal."	
1909.										
July.....	681.487	2.06	23.49	67.34	7.11	1.93	7.27	14,096	14,391	\$3.3931
	302.210	1.50	23.24	67.57	7.69	1.91	7.81	14,137	14,351	3.4030
August.....	391.277	2.09	21.37	68.41	8.13	2.06	8.30	14,059	14,359	3.3642
	579.594	1.30	20.55	69.00	9.15	2.03	9.25	13,265	14,110	3.3119
September.....	728.348	2.00	20.75	70.30	6.95	2.03	7.15	14,265	14,610	3.4338
	213.763	1.85	21.00	69.15	8.00	2.03	8.15	14,095	14,360	3.3729
October.....	313.513	.95	21.25	69.65	8.15	1.93	8.30	14,130	14,325	3.3813
	577.661	1.45	22.00	68.75	7.80	1.60	7.90	14,170	14,375	3.4109
November.....	683.366	1.70	21.50	69.30	7.50	2.12	7.65	14,035	14,360	3.3784
	409.598	1.55	21.50	68.65	8.30	2.38	8.45	14,110	14,330	3.3765
December.....	403.795	2.75	21.00	68.65	7.60	2.18	7.80	13,995	14,395	3.3688
	324.884	1.15	21.00	66.40	11.45	2.98	11.55	13,570	13,735	3.1465
1910.										
January.....	382.581	2.20	20.50	66.65	10.65	2.40	10.90	13,595	13,900	3.2025
	560.500	3.25	20.50	66.75	9.50	2.53	9.80	13,695	14,155	3.3216
February.....	461.768	1.95	20.50	67.15	10.40	2.58	10.60	13,725	13,995	3.2838
	329.741	2.45	20.75	66.85	9.95	2.75	10.15	13,625	13,965	3.2097
March.....	371.183	1.90	20.25	68.05	9.80	2.28	9.95	13,760	14,025	3.2722
	566.357	1.95	20.50	67.70	9.35	2.73	10.05	13,790	14,060	3.2495
April.....	461.585	1.55	21.00	67.10	10.35	2.45	10.55	13,715	13,925	3.2314
	205.652	2.10	20.50	67.35	10.05	2.08	10.25	13,650	13,940	3.2158
May.....	388.013	2.65	27.75	58.15	11.45	2.28	11.80	13,255	13,615	3.0707
	464.375	2.70	21.50	66.90	8.90	1.95	9.15	13,795	14,175	3.2807
June.....	411.179	2.15	21.00	68.10	8.75	2.30	8.95	13,925	14,230	3.3319
	365.366	1.95	20.75	69.20	8.10	2.30	8.25	14,070	14,348	3.3669
Total.....	10,577.796									
Average.....		1.98	21.43	67.75	8.84	2.23	9.02	13,904	14,185	3.3069

## NEW YORK, N. Y., CUSTOMHOUSE.

[Pittston, No. 2 buckwheat anthracite, Pittston mines, Luzerne County, Pa.; 2,500 tons at \$3.05; 18 per cent ash, 11,150 B. t. u.]

1909.										
September.....	179.922	5.65	7.50	66.45	20.40	1.05	21.60	10,865	11,520	\$2.9320
October.....	218.381	4.60	6.25	72.55	16.60	.70	17.40	11,615	12,175	3.1772
November.....	206.585	6.05	7.00	70.95	16.00	.80	17.05	11,650	12,400	3.1868
December.....	243.482	4.40	6.25	71.10	18.25	.63	19.10	11,570	12,105	3.1649
1910.										
January.....	613.837	7.75	5.75	69.55	16.95	.93	18.35	11,180	12,115	3.0582
February.....	241.732	6.15	6.50	70.90	16.45	.73	17.50	11,545	12,300	3.1580
March.....	249.125	6.60	7.25	69.40	16.75	.80	17.90	11,350	12,145	3.1047
Total.....	1,953.064									
Average.....		6.26	6.45	70.09	17.20	.82	18.35	11,365	12,124	3.1088

## NEW YORK, N. Y., PANAMA RAILROAD CO.

[Arico run of mine, C' bed, Orenda mine, Boswell, Somerset County, Pa.; 70,000 tons at \$2.64; 14,000 B. t. u.]

1909.										
April.....	900	2.78	16.83	72.91	7.48	1.27	7.70	14,200	14,606	\$2.64
May 3.....	1,065	2.69	16.47	71.86	8.98	.88	9.22	13,833	14,217	2.60
May 7-11.....	900	3.22	16.77	71.93	8.08	.92	8.35	13,870	14,330	2.60
May 11.....	500	2.25	17.50	71.75	8.50	1.05	8.70	13,950	14,275	2.62
May 19.....	923	1.98	17.12	72.55	8.35	.98	8.52	14,040	14,330	2.64
May 25.....	951	1.68	17.43	72.94	7.95	.87	8.09	14,090	14,330	2.64
June 2.....	507	2.56	17.00	72.15	8.29	.74	8.51	13,896	14,260	2.60
June 2.....	970	2.45	16.63	72.88	8.04	.71	8.25	13,949	14,301	2.62
June 8-10.....	751	2.64	17.01	72.16	8.19	.85	8.41	13,929	14,308	2.62
June 21-24.....	1,618	1.91	16.88	72.61	8.60	.91	8.77	13,985	14,255	2.62
Do.....	784	2.34	16.87	72.73	8.06	.89	8.25	14,000	14,322	2.64
June 26-29.....	456	2.77	16.95	71.79	8.49	.88	8.73	13,870	14,266	2.60
June 30-July 1.....	732	2.13	17.23	72.60	8.04	.81	8.21	14,024	14,331	2.64

a Penalty of 2 cents per ton provided for every 100 B. t. u. below the standard of 14,000.

TABLE 9.—Analyses of coals delivered to the Government under contracts, 1909-10—Con.

## NEW YORK, N. Y., PANAMA RAILROAD CO.—Continued.

Date.	Tons delivered.	Proximate analysis, "as received."					Ash "dry coal."	B. t. u.		Corrected price per ton.
		Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.		"As received."	"Dry coal."	
1909.										
July 7-10.....	884	1.74	17.60	72.13	8.53	.93	8.68	14,017	14,265	\$2.64
July 12-15.....	1,388	1.54	16.84	72.85	8.77	.97	8.95	13,985	14,204	2.62
July 13-16.....	894	1.87	16.79	72.52	8.82	.94	8.99	13,958	14,224	2.62
July 21-22.....	518	1.99	17.30	72.32	8.39	.85	8.56	13,975	14,257	2.62
July 26-Aug. 2.....	1,417	2.24	16.51	72.60	8.65	.88	8.85	13,910	14,220	2.62
July 26-29.....	851	2.89	16.47	72.46	8.18	.85	8.42	13,920	14,336	2.62
July 30-Aug. 1.....	854	1.96	16.68	71.00	10.36	.90	10.57	13,636	13,914	2.56
July 30-Aug. 2.....	941	2.54	16.39	72.43	8.64	.84	8.87	13,878	14,239	2.60
Aug. 7.....	867	2.58	16.87	71.46	9.09	1.06	9.33	13,865	14,231	2.60
Aug. 12-14.....	488	2.64	16.93	71.38	9.05	.82	9.30	13,833	14,207	2.60
Aug. 17-19.....	1,376	3.17	16.03	71.04	9.76	.90	10.05	13,627	14,074	2.56
Aug. 18-20.....	758	2.46	16.78	70.42	10.34	.88	10.59	13,605	13,948	2.56
Aug. 24-27.....	842	2.40	16.41	70.60	10.59	.90	10.85	13,623	13,957	2.56
Aug. 26-30.....	1,011	2.48	16.31	71.54	9.67	.88	9.91	13,745	14,095	2.58
Sept. 7-8.....	497	1.94	16.90	71.18	9.98	.85	10.18	13,792	14,062	2.58
Sept. 10-13.....	810	2.21	16.81	71.57	9.41	.86	9.63	13,743	14,053	2.58
Sept. 16-20.....	930	2.48	16.88	71.99	8.65	.86	8.88	13,955	14,310	2.62
Do.....	1,477	2.65	16.59	71.49	9.27	.95	9.54	13,796	14,167	2.58
Sept. 22-24.....	832	2.79	16.33	71.75	9.13	.96	9.42	13,827	14,223	2.60
Sept. 27-29.....	1,399	2.75	16.64	71.74	8.87	.80	9.14	13,791	14,181	2.58
Sept. 30.....	525	2.44	16.50	71.90	9.16	.87	9.40	13,836	14,182	2.60
Oct. 4.....	795	2.67	16.43	72.23	8.67	.86	8.83	13,903	14,273	2.62
Oct. 9.....	973	2.47	16.72	72.42	8.39	.81	8.60	13,963	14,321	2.62
Oct. 15.....	913	2.36	16.94	71.44	9.28	.97	9.50	13,773	14,106	2.58
Oct. 21.....	1,391	2.20	16.75	72.12	8.93	.88	9.14	13,858	14,171	2.60
Oct. 26.....	773	2.68	16.70	70.96	9.66	.83	9.95	13,624	14,000	2.56
Oct. 29.....	879	3.11	16.31	70.58	10.00	.98	10.35	13,470	13,903	2.52
Nov. 1.....	973	2.66	16.44	72.30	8.60	.80	8.83	13,792	14,168	2.58
Nov. 6.....	536	2.84	16.10	71.46	9.60	.84	9.90	13,584	13,980	2.54
Nov. 12.....	962	2.66	16.13	71.98	9.23	.78	9.51	13,635	14,007	2.56
Nov. 16.....	685	2.89	16.07	72.30	8.74	.84	8.98	13,789	14,193	2.58
Nov. 18.....	1,361	2.43	16.27	72.22	9.08	.92	9.39	13,769	14,112	2.58
Nov. 23.....	798	2.84	16.39	71.93	8.84	.91	9.11	13,753	14,155	2.58
Nov. 29.....	516	2.34	16.30	73.18	8.18	.86	8.38	13,960	14,294	2.62
Dec. 2.....	1,105	3.19	16.70	71.49	8.62	.86	8.90	13,773	14,227	2.58
Dec. 3.....	903	2.51	16.19	71.47	9.83	.84	10.08	13,706	14,059	2.58
Dec. 10.....	781	2.37	16.21	72.15	9.27	.86	9.47	13,800	14,135	2.60
Dec. 18.....	964	2.29	16.22	71.79	9.70	.85	9.93	13,779	14,102	2.58
Dec. 19.....	1,653	2.74	16.27	70.39	10.60	.86	10.87	13,500	13,880	2.54
Dec. 23.....	516	2.62	16.60	70.84	10.14	2.28	10.42	13,606	13,972	2.56
Dec. 29.....	1,033	2.81	16.44	70.58	10.17	1.28	10.47	13,574	13,967	2.54
1910.										
Jan. 6-8.....	829	3.57	16.36	70.46	9.61	.81	9.97	13,486	13,985	2.52
Jan. 7-11.....	1,430	3.89	16.32	69.87	9.92	.87	10.33	13,344	13,884	2.50
Jan. 13.....	959	3.44	16.21	70.09	10.26	.71	10.63	13,460	13,940	2.52
Jan. 20.....	532	4.42	15.90	70.36	9.32	1.05	9.74	13,514	14,139	2.54
Jan. 25-28.....	1,018	4.00	16.28	69.73	9.99	.99	10.41	13,396	13,954	2.50
Jan. 28.....	1,609	3.13	16.50	70.47	9.90	.87	10.21	13,566	14,004	2.54
Jan. 31.....	657	2.83	16.43	71.04	9.70	.80	9.96	13,691	14,090	2.56
Feb. 4-7.....	970	3.59	16.06	69.85	10.50	.97	10.88	13,404	13,903	2.52
Feb. 9-11.....	1,247	2.47	16.36	70.03	11.14	.90	11.41	13,475	13,816	2.52
Feb. 12-14.....	530	2.74	16.40	70.20	10.66	.90	10.94	13,502	13,883	2.54
Feb. 16-19.....	950	2.61	16.44	71.00	9.95	.90	10.21	13,665	14,031	2.56
Feb. 24.....	846	2.94	16.29	70.56	10.21	.89	10.53	13,563	13,974	2.54
Mar. 3-5.....	947	2.98	15.94	70.67	10.41	1.08	10.73	13,571	13,978	2.54
Mar. 6-8.....	1,337	3.18	16.05	71.03	9.74	1.00	10.06	13,625	14,073	2.56
Mar. 9-10.....	501	2.78	16.00	71.72	9.50	.95	9.78	13,754	14,147	2.58
Mar. 14-15.....	945	2.18	15.75	70.92	11.15	1.01	11.41	13,474	13,774	2.52
Mar. 15-17.....	1,343	2.06	15.73	71.29	10.92	1.04	11.14	13,529	13,813	2.54
Mar. 19-22.....	742	2.20	16.00	71.33	10.47	1.08	10.69	13,643	13,950	2.56
Mar. 24-25.....	545	1.92	16.00	72.50	9.58	.96	9.78	13,836	14,107	2.60
Mar. 26-29.....	953	2.24	16.06	70.89	10.81	1.11	11.04	13,558	13,868	2.54
Apr. 2-4.....	523	1.88	16.10	72.18	9.84	1.16	10.00	13,802	14,066	2.60
Apr. 5-7.....	1,040	2.05	16.05	72.06	9.84	1.11	10.07	13,795	14,085	2.58
Apr. 8-9.....	965	1.96	15.75	72.00	10.29	.97	10.49	13,754	14,029	2.58
Apr. 13-14.....	771	1.84	16.07	72.32	9.77	.87	9.94	13,824	14,083	2.60
Apr. 15-18.....	1,196	1.83	16.00	72.47	9.70	.90	9.90	13,849	14,107	2.60
Apr. 19-21.....	513	1.70	15.90	72.50	9.90	.98	10.06	13,816	14,055	2.60
Total.....	73,027									
Average.....		2.56	16.47	71.58	9.39	.93	9.64	13,748	14,108	2.58

TABLE 9.—Analyses of coals delivered to the Government under contracts, 1909-10—Con.

## NEW YORK, N. Y., SUBTREASURY.

[Plymouth No. 1 pea anthracite, Plymouth, Pa.; 150 tons, at \$4.07; 10.75 per cent ash, 12,870 B. t. u.]

Date.	Tons delivered.	Proximate analysis, "as received."					Ash "dry coal."	B. t. u.		Corrected price per ton.
		Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.		"As received."	"Dry coal."	
1909.										
August.....	75	3.70	6.00	76.90	13.40	0.65	14.00	12,380	12,860	\$3.8750
1910.										
January.....	75	2.95	5.75	77.75	13.55	.63	13.95	12,340	12,720	3.8624
Total.....	150									
Average.....		3.33	5.87	77.33	13.47	.64	13.98	12,360	12,786	3.8687

## NORFOLK, VA., NAVY YARD.

Pocahontas run of mine, No. 3 bed, Big Vein No. 1 and No. 2 mines, Pocahontas, Va.; 15,000 tons, at \$2.57; 4 per cent ash, 14,800 B. t. u.]

1909.										
July.....	1,460.08	2.23	20.41	73.38	3.98	0.71	4.08	14,804	15,142	\$2.5707
August.....	939.32	2.71	21.19	72.26	3.84	.64	3.95	14,797	15,209	2.5695
September.....	781.48	2.58	20.56	71.68	5.18	.68	5.33	14,602	14,981	2.5356
October.....	1,168.29	2.50	21.29	71.35	4.86	.61	5.00	14,616	14,991	2.5380
November.....	1,477.02	2.69	21.01	71.47	4.83	.68	4.96	14,579	14,982	2.5316
December.....	1,171.63	2.88	20.65	71.66	4.81	.65	4.95	14,590	15,023	2.5335
1910.										
January.....	1,143.44	3.63	20.56	70.09	5.72	.65	5.94	14,258	14,795	2.4759
February.....	869.59	2.67	19.26	71.02	7.05	.64	7.23	14,220	14,610	2.4293
March.....	1,245.18	3.64	20.08	70.95	5.33	.62	5.53	14,412	14,956	2.5026
April.....	1,328.29	3.05	18.78	72.29	5.88	.70	6.06	14,383	14,835	2.4776
May.....	797.21	3.45	19.90	70.45	6.20	.66	6.42	14,206	14,714	2.4469
June.....	1,281.27	4.34	19.79	69.88	5.99	.69	6.26	14,165	14,808	2.4397
Total.....	13,662.88									
Average.....		3.03	20.30	71.43	5.24	.66	5.41	14,479	14,931	2.5143

## NORFOLK, VA., PANAMA RAILROAD CO.

[Pocahontas run of mine; 400,000 tons, at \$2.34 and \$2.44; 4,600 B. t. u.]

1909.										
Apr. 5-6.....	5,543.0	2.57					6.83	14,347	14,726	\$2.29
Apr. 10-12.....	5,022.0	2.68					6.58	14,406	14,802	2.32
Apr. 16-19.....	5,001.5	2.52					5.10	14,642	15,021	2.34
Apr. 28-29.....	5,434.5	2.98	18.93	73.00	5.09	0.71	5.24	14,595	15,043	2.33
May 3-4.....	5,448.5	2.81	19.22	73.03	4.94	.66	5.07	14,541	14,961	2.33
May 8-10.....	5,009.0	2.09	18.41	73.95	5.55	.59	5.67	14,566	14,877	2.33
May 13-14.....	5,669.0	2.46	17.92	73.57	6.05	.57	6.20	14,423	14,787	2.32
May 18-20.....	5,529.5	2.72	17.96	73.48	5.84	.63	6.00	14,457	14,857	2.32
May 25.....	5,015.5	3.56	18.28	72.31	5.85	.65	6.07	14,253	14,790	2.29
May 28-29.....	4,611.0	3.62	16.88	73.87	5.63	.51	5.84	14,274	14,810	2.29
June 2-3.....	5,739.0	2.75	17.87	73.17	6.21	.56	6.38	14,289	14,695	2.29
June 4-7.....	5,495.0	4.34	18.02	71.93	5.71	.63	5.97	14,204	14,848	2.24
June 11-12.....	5,047.0	3.18	18.67	73.03	5.12	.65	5.29	14,426	14,900	2.32
June 16-17.....	5,590.0	3.08	18.73	73.17	5.02	.67	5.18	14,478	14,939	2.32
June 23-24.....	5,038.0	1.88	18.57	73.92	5.63	.68	5.74	14,605	14,885	2.34
July 1-2.....	4,831.0	2.18	18.69	73.67	5.46	.65	5.58	14,543	14,867	2.33
July 3-5.....	5,739.0	2.79	18.78	73.36	5.07	.80	5.20	14,488	14,904	2.32
July 6-7.....	5,531.0	3.48	18.44	72.32	5.76	.66	5.97	14,244	14,757	2.24
July 9-10.....	5,565.0	2.77	18.97	72.86	5.40	.70	5.55	14,486	14,899	2.32
July 10-12.....	5,469.5	2.30	19.05	72.69	5.96	.70	6.09	14,482	14,824	2.32
July 13-14.....	4,708.0	2.48	19.04	73.22	5.26	.73	5.39	14,578	14,948	2.33
July 17-19.....	5,020.5	2.01	18.87	73.65	5.47	.67	5.58	14,624	14,922	2.34
July 20-21.....	4,620.5	1.92	18.99	73.59	5.50	.68	5.61	14,624	14,911	2.34
July 23.....	5,597.0	1.87	18.05	74.91	5.17	.64	5.27	14,643	14,926	2.34
July 26.....	5,053.0	2.01	18.22	73.99	5.78	.66	5.90	14,491	14,789	2.32
July 31-Aug. 2.....	4,756.0	3.03	18.66	73.21	5.10	.57	5.25	14,530	14,985	2.33
Aug. 6-7.....	5,713.0	3.06	18.32	73.82	4.80	.62	4.95	14,616	15,077	2.34

a Price f. o. b. steamers: Apr. 1 to Aug. 31, 1909, \$2.34; Sept. 1, 1909, to Mar. 31, 1910, \$2.44; a penalty provided of 1 cent per ton for each 100 B. t. u. or fraction thereof below the standard of 14,600, down to a minimum of 14,350 B. t. u., and a penalty provided of 5 cents per ton for each 100 B. t. u. or fraction thereof below 14,350.

TABLE 9.—Analyses of coals delivered to the Government under contracts, 1909-10—Con.

## NORFOLK VA., PANAMA RAILROAD CO.—Continued.

Date.	Tons delivered.	Proximate analysis, "as received."					Ash "dry coal."	B. t. u.		Corrected price per ton.
		Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.		"As received."	"Dry coal."	
1909.										
Aug. 7-9 . . . . .	5,492.0	2.36	17.98	74.41	5.25	.59	5.38	14,620	14,973	\$2.34
Aug. 11-12 . . . . .	5,566.0	2.34	17.93	74.59	5.14	.73	5.27	14,613	14,963	2.34
Aug. 17-18 . . . . .	5,485.0	3.08	18.39	73.63	4.90	.62	5.06	14,508	14,969	2.33
Aug. 20-21 . . . . .	5,055.0	2.27	18.08	74.03	5.62	.69	5.72	14,549	14,887	2.33
Aug. 25-26 . . . . .	5,617.0	1.59	18.34	74.46	5.61	.61	5.70	14,720	14,957	2.34
Aug. 28-31 . . . . .	5,031.0	2.32	18.21	73.42	6.05	.59	6.19	14,529	14,873	2.33
Sept. 1 . . . . .	5,446.5	2.05	18.50	74.01	5.44	.62	5.55	14,638	14,938	2.44
Sept. 5 . . . . .	5,733.0	2.24	18.57	73.97	5.22	.69	5.34	14,606	14,939	2.44
Sept. 11-14 . . . . .	5,584.5	2.74	18.86	73.28	5.12	.66	5.26	14,536	14,960	2.43
Sept. 15-16 . . . . .	5,623.5	2.53	18.50	74.05	4.92	.58	5.04	14,699	15,059	2.44
Sept. 20-21 . . . . .	5,440.5	2.69	18.08	74.35	4.88	.64	5.02	14,633	15,036	2.44
Sept. 24 . . . . .	5,041.5	2.40	17.88	74.91	4.81	.57	4.93	14,687	15,051	2.44
Sept. 28 . . . . .	5,597.5	2.32	18.14	74.25	5.29	.53	5.43	14,608	14,955	2.44
Oct. 2-4 . . . . .	5,507.0	2.43	18.21	74.58	4.78	.55	4.91	14,664	15,030	2.44
Oct. 7 . . . . .	5,725.5	2.42	17.93	74.58	5.00	.59	5.13	14,666	15,028	2.44
Oct. 11-12 . . . . .	5,005.0	2.72	17.97	74.70	4.61	.53	4.77	14,654	15,062	2.44
Oct. 14 . . . . .	5,534.0	3.01	17.61	74.07	5.31	.58	5.45	14,461	14,917	2.42
Oct. 22 . . . . .	5,440.5	2.00	17.88	74.53	5.59	.60	5.70	14,617	14,916	2.44
Oct. 27 . . . . .	5,588.0	2.60	18.07	74.45	4.88	.59	5.01	14,589	14,979	2.42
Oct. 29 . . . . .	5,140.0	2.93	18.54	74.00	4.53	.56	4.64	14,594	15,033	2.42
Nov. 1 . . . . .	5,016.5	2.21	18.25	74.79	4.75	.56	4.86	14,648	14,979	2.44
Nov. 4 . . . . .	5,948.0	2.40	18.18	74.39	5.03	.61	5.16	14,536	14,893	2.43
Nov. 8 . . . . .	5,762.0	2.34	18.67	74.78	4.31	.63	4.41	14,749	15,102	2.44
Nov. 12-13 . . . . .	5,073.0	2.64	18.63	74.16	4.57	.60	4.70	14,612	15,002	2.44
Nov. 25-26 . . . . .	5,496.0	2.06	17.54	75.50	4.90	.63	5.08	14,637	14,944	2.44
Nov. 27-29 . . . . .	5,577.0	2.45	18.54	74.65	4.36	.70	4.46	14,695	15,064	2.44
Nov. 29-30 . . . . .	5,527.5	2.63	18.39	74.82	4.16	.59	4.27	14,692	15,089	2.44
Dec. 2-3 . . . . .	5,542.0	2.61	18.39	74.28	4.72	.71	4.85	14,610	15,001	2.44
Dec. 7 . . . . .	6,008.0	2.59	18.22	74.21	4.98	.64	5.11	14,592	14,980	2.43
Dec. 10-13 . . . . .	6,067.0	3.09	18.22	73.75	4.94	.65	5.08	14,509	14,972	2.43
Dec. 14 . . . . .	5,528.5	4.32	17.71	72.57	5.40	.65	5.64	14,242	14,885	2.34
Dec. 15 . . . . .	6,104.0	3.67	18.30	72.42	5.61	.74	5.81	14,314	14,859	2.39
Dec. 21 . . . . .	5,844.0	2.37	18.23	73.49	5.91	.61	6.04	14,490	14,842	2.42
Dec. 31 . . . . .	5,098.0	2.69	18.58	73.12	5.61	.68	5.75	14,434	14,833	2.42
1910.										
Jan. 8 . . . . .	5,043.5	3.25	17.92	73.26	5.57	.66	5.76	14,388	14,871	2.41
Jan. 13 . . . . .	5,662.0	3.06	18.29	73.24	5.41	.64	5.57	14,454	14,910	2.42
Jan. 15 . . . . .	6,320.5	3.09	17.84	73.28	5.79	.63	5.98	14,370	14,828	2.41
Jan. 20 . . . . .	5,530.0	3.30	17.79	72.41	6.50	.75	6.73	14,183	14,667	2.34
Jan. 24 . . . . .	6,221.5	3.73	18.10	72.42	5.75	.59	6.00	14,288	14,842	2.39
Jan. 31 . . . . .	5,506.5	3.74	18.47	72.81	4.98	.77	5.18	14,397	14,956	2.41
Feb. 8 . . . . .	5,582.0	3.16	18.32	73.80	4.72	.77	4.86	14,585	15,061	2.43
Feb. 21 . . . . .	5,803.5	2.97	17.97	72.78	6.28	.58	6.46	14,284	14,721	2.39
Feb. 25 . . . . .	5,055.0	2.67	17.96	73.44	5.93	.60	6.13	14,405	14,800	2.42
Mar. 8 . . . . .	4,904.0	2.19	17.96	74.53	5.32	.61	5.43	14,602	14,929	2.44
Mar. 10 . . . . .	5,572.5	2.78	17.65	74.49	5.08	.60	5.22	14,538	14,954	2.43
Mar. 18-19 . . . . .	4,996.0	1.89	17.62	75.35	5.14	.70	5.24	14,662	14,944	2.44
Mar. 26-29 . . . . .	6,315.5	1.78	17.69	76.23	4.30	.67	4.35	14,773	15,041	2.44
Apr. 4-5 . . . . .	5,021.0	2.06	17.12	77.20	3.62	.66	3.68	14,888	15,200	2.44
Total . . . . .	407,376.0									
Average . . . . .		2.63	18.25	73.87	5.25	.64	5.39	14,528	14,921	

TABLE 9.—Analyses of coals delivered to the Government under contracts, 1909-10—Con.

## NORFOLK, VA., UNITED STATES NAVAL HOSPITAL.

[Pocahontas run of mine, Thin bed, Oregon mine, near Welch, W. Va.; 2,000 tons at \$2.85; 6 per cent ash, 0.75 per cent sulphur, 14,600 B. t. u.]

Date.	Tons delivered.	Proximate analysis, "as received."					Ash "dry coal."	B. t. u.		Corrected price per ton.
		Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.		"As received."	"Dry coal."	
1909.										
August.....	50	1.90	18.52	74.29	5.29	0.85	5.39	14,583	14,865	\$2.8467
September.....	100	2.20	18.75	71.60	7.45	.83	7.60	14,175	14,490	2.7670
October.....	130	1.39	18.91	72.70	7.00	.71	7.14	14,361	14,563	2.8033
November.....	200	1.68	18.75	72.00	7.57	.61	7.70	14,203	14,446	2.7725
December.....	393	1.44	19.01	71.57	7.98	.75	8.08	14,156	14,363	2.7433
1910.										
January.....	137	2.92	18.46	70.08	8.54	.69	8.81	13,893	14,311	2.6920
February.....	227	3.57	17.82	69.61	9.00	.66	9.32	13,533	14,034	2.6017
March.....	150	3.04	18.00	73.70	5.26	1.63	5.40	14,411	14,863	2.8131
April.....	92	3.10	17.50	73.10	6.30	.80	6.50	14,330	14,790	2.7973
May.....	188	2.82	19.46	71.99	5.73	.78	5.93	14,409	14,827	2.8127
June.....	63	3.00	17.50	70.10	9.40	.50	9.70	13,720	14,150	2.6382
Total.....	1,760									
Average.....		2.36	18.56	71.70	7.38	.81	7.55	14,135	14,478	2.7592

## OMAHA, NEBR., COURTHOUSE AND POST OFFICE.

[Cherokee run of mine, Englevale, Kans.; 1,700 tons at \$4.64; 11 per cent ash, 12,000 B. t. u.]

1909.										
July.....	20.973	4.01	31.29	48.24	16.46	5.65	17.15	11,719	12,209	\$4.3513
August.....	40.737	3.75	32.25	48.35	15.65	6.90	16.30	11,595	12,050	4.3634
September.....	99.330	6.25	29.25	50.10	14.40	5.55	15.35	11,670	12,445	4.4244
October.....	99.995	7.95	33.00	48.15	10.90	4.08	11.85	11,805	12,825	4.5646
November.....	157.571	6.25	32.25	50.50	11.00	3.90	11.75	12,305	13,130	4.7579
December.....	319.589	8.35	35.00	43.75	12.90	2.48	14.05	11,195	12,210	4.2887
1910.										
January.....	382.982	11.25	33.50	39.65	15.60	3.75	17.55	10,420	11,740	3.8491
February.....	188.210	7.20	33.50	44.60	14.70	3.58	15.85	11,400	12,280	4.3380
March.....	147.746	5.99	30.39	45.98	17.64	5.55	18.73	11,337	12,059	4.1336
April.....	77.795	6.40	32.67	47.36	13.57	2.16	14.49	11,702	12,502	4.4848
May.....	51.719	7.85	33.00	44.70	14.45	2.98	15.65	11,100	12,050	4.2220
June.....	58.103	15.35	34.50	35.40	14.75	2.88	17.40	9,780	11,553	3.6016
Total.....	1,644.750									
Average.....		8.30	33.03	44.46	14.21	3.76	15.50	11,211	12,226	4.2649

## PENSACOLA, FLA., NAVY YARD.

[Blocton Cahaba red-ash lump, Blocton, Ala.; 2,700 tons at \$3.21; 5.64 per cent ash, 0.75 per cent sulphur, 14,500 B. t. u.]

1909.										
July.....	40.16	2.48	36.34	56.18	5.00	0.73	5.13	13,938	14,292	\$3.0856
September.....	71.43	2.35	35.25	55.45	6.95	.53	7.10	13,560	13,890	3.0019
October.....	182.00	1.88	34.10	59.70	4.32	1.02	4.42	14,392	14,668	3.1961
November.....	191.07	1.80	32.67	61.41	4.12	.85	4.20	14,511	14,777	3.2224
December.....	115.42	1.96	34.98	60.44	2.62	.88	2.67	14,652	14,945	3.2636
1910.										
January.....	228.35	1.92	31.61	62.64	3.83	1.18	3.90	14,572	14,857	3.2359
February.....	109.82	1.99	30.55	60.23	7.23	1.28	7.38	14,059	14,344	3.1124
March.....	150.58	1.86	32.06	60.97	5.11	.85	5.21	14,292	14,563	3.1640
April.....	148.08	1.60	31.75	62.67	3.98	1.44	4.02	14,660	14,898	3.2554
May.....	112.11	1.67	30.55	61.75	6.03	1.35	6.13	14,244	14,486	3.1533
June.....	122.59	2.03	35.42	58.73	3.82	1.06	3.90	14,345	14,642	3.1857
Total.....	1,471.61									
Average.....		1.90	32.84	60.68	4.58	1.05	4.67	14,380	14,658	3.1834

a This tonnage not exact.



TABLE 9.—Analyses of coals delivered to the Government under contracts, 1909-10—Con.

## PHILADELPHIA, PA., APPRAISER'S STORES.

[Lehigh pea anthracite, Newcastle colliery; 350 tons at \$3.49; 15.80 per cent ash, 11,865 B. t. u.]

Date.	Tons delivered.	Proximate analysis, "as received."					Ash "dry coal."	B. t. u.		Corrected price per ton.
		Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.		"As received."	"Dry coal."	
1909.										
October.....	37	4.70	5.50	70.30	19.50	0.70	20.50	11,180	11,730	\$3.2185
November.....	30	5.05	7.00	72.05	15.90	.70	16.75	11,580	12,195	3.4062
December.....	65	4.40	5.00	75.30	15.30	.75	16.00	11,870	12,420	3.4915
1910.										
January.....	64	6.00	4.50	72.40	17.10	.60	18.20	11,460	12,190	3.3509
February.....	57	5.25	5.25	72.10	17.40	.48	18.30	11,415	12,045	3.3376
March.....	40	4.30	5.50	74.55	15.65	.68	16.40	11,900	12,435	3.5003
April.....	41	4.40	4.75	72.80	18.05	.70	18.90	11,540	12,070	3.3544
Total.....	334									
Average.....		4.93	5.21	72.96	16.90	.65	17.78	11,574	12,179	3.4044

## PHILADELPHIA, PA., COURTHOUSE AND POST OFFICE.

[Susquehanna barley anthracite, through  $\frac{3}{16}$ " and over  $\frac{3}{8}$ " round openings, Susquehanna mines, Nanticoke, Pa.; 2,800 tons at \$2.35; 13 per cent ash, 11,500 B. t. u.]

1909.										
July.....	203.969	6.11	9.20	68.42	16.27	.74	17.33	11,284	12,017	\$2.2359
August.....	207.761	2.40	10.10	72.30	15.20	.55	15.60	12,555	12,860	2.5456
September.....	210.440	3.05	10.50	71.75	14.70	.75	15.20	12,505	12,895	2.5354
October.....	252.286	3.20	9.25	73.15	14.40	.63	14.90	12,525	12,935	2.5595
November.....	261.453	5.65	7.00	75.50	11.85	.80	12.55	12,255	12,980	2.5043
December.....	382.047	5.10	10.00	70.45	14.45	.65	15.20	12,105	12,760	2.4536
1910.										
January.....	409.502	7.95	7.50	69.95	14.60	.60	15.90	11,780	12,790	3.3872
February.....	333.915	4.25	8.75	71.15	15.85	.68	16.55	12,155	12,685	2.4438
March.....	282.424	5.55	6.75	73.90	13.80	.50	14.65	11,980	12,685	2.4481
April.....	219.931	7.75	6.75	73.90	11.60	.55	12.55	11,645	12,620	2.3796
May.....	219.246	6.30	7.50	74.00	12.20	.63	13.00	11,860	12,660	2.4236
June.....	176.440	7.15	8.25	73.25	11.35	.65	12.20	11,875	12,795	2.4266
Total.....	3,159.414									
Average.....		5.45	8.43	72.12	14.00	.64	14.80	12,045	12,739	2.4614

## PHILADELPHIA, PA., COURTHOUSE AND POST OFFICE.

[Whitney, run of mine, Miller bed, Whitney No. 1 mine, Clearfield County, Pa.; 700 tons at \$3.20; 6 per cent ash, 14,200 B. t. u.]

1909.										
July.....	30.049	2.03	22.19	69.02	6.76	1.30	6.90	14,290	14,586	\$3.2203
August.....	20.513	1.30	22.60	68.50	7.60	1.20	7.70	14,250	14,440	3.2113
September.....	28.750	2.70	22.50	68.20	6.60	.98	6.80	14,225	14,620	3.2056
October.....	29.915	1.80	21.50	69.80	6.90	1.00	7.10	14,260	14,520	3.2135
November.....	31.681	1.70	22.50	67.80	8.00	1.75	8.20	14,140	14,380	3.1665
December.....	44.824	2.80	22.50	66.80	7.90	.95	8.10	13,980	14,390	3.1304
1910.										
January.....	64.708	5.80	21.00	64.50	8.70	1.20	9.20	13,400	14,230	2.9797
February.....	42.897	2.90	22.50	65.80	8.80	2.00	9.00	13,690	14,090	3.0651
March.....	21.897	2.10	21.50	68.70	7.70	1.10	7.90	14,120	14,430	3.1820
April.....	25.475	2.90	22.00	67.90	7.20	1.05	7.40	14,020	14,435	3.1594
May.....	25.455	2.20	22.50	67.35	7.95	1.13	8.15	13,970	14,280	3.1282
June.....	25.638	2.35	20.25	70.30	7.10	2.05	7.30	14,195	14,535	3.1989
Total.....	391.202									
Average.....		2.89	21.92	67.43	7.76	1.31	8.00	13,968	14,384	3.1477

TABLE 9.—Analyses of coals delivered to the Government under contracts, 1909-10—Con.

## PHILADELPHIA, PA., CUSTOMHOUSE.

[Deringer or Wyoming egg anthracite, Deringer or Kingston mines, Deringer and Nanticoke, Pa.; 120 tons at \$5.95; 6.31 per cent ash, 13,488 B. t. u.]

Date.	Tons delivered.	Proximate analysis, "as received."					Ash "dry coal."	B. t. u.		Corrected price per ton.
		Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.		"As received."	"Dry coal."	
1909.										
October.....	12	3.30	5.50	81.40	9.80	.75	10.10	12,980	13,430	\$5.6859
November.....	12	2.60	6.00	82.20	9.20	.90	9.40	13,200	13,550	5.7830
December.....	15	3.60	6.50	80.00	9.90	.75	10.20	12,900	13,380	5.6506
1910.										
January.....	24	4.40	4.00	83.50	8.10	.50	8.50	13,200	13,810	5.8030
February.....	15	4.00	5.50	80.30	10.20	.70	10.60	12,870	13,400	5.6074
March.....	15	3.60	4.50	82.30	9.60	.60	10.00	13,030	13,520	5.7080
April.....	15	3.50	6.00	79.10	11.40	.60	11.80	12,800	13,270	5.5765
Total.....	108									
Average..		3.67	5.29	81.42	9.62	.66	9.98	13,009	13,505	5.6987

## PHILADELPHIA, PA., ENGINEER OFFICE, UNITED STATES ARMY.

[Run of mine, Cambria County, Pa.; 16,000 tons at \$2.90 and \$3.30;  $\alpha$  8.5 per cent ash, 1.5 per cent sulphur, 14,100 B. t. u. (dry coal)—

1909.										
March.....	95	4.09	16.80	73.83	5.28	1.15	5.50	14,267	14,875	.....
April.....	536	1.91	17.86	72.34	7.89	2.30	8.04	14,173	14,449	.....
May.....	1,078	1.86	18.50	72.97	6.67	1.56	6.80	14,368	14,640	.....
June.....	1,316	2.13	20.87	70.92	6.08	1.64	6.21	14,405	14,719	.....
July.....	1,459	2.08	20.52	71.15	6.25	1.75	6.38	14,409	14,715	.....
August.....	1,106	1.89	20.73	71.06	6.32	1.45	6.44	14,468	14,747	.....
September.....	1,208	2.43	20.63	70.37	6.57	1.58	6.74	14,394	14,752	.....
October.....	1,483	1.82	20.74	71.44	6.00	1.50	6.12	14,475	14,743	.....
November.....	1,357	2.21	20.53	71.49	5.77	1.43	5.93	14,452	14,779	.....
December.....	1,070	2.24	21.45	69.68	6.63	1.52	6.79	14,308	14,636	.....
1910.										
January.....	1,153	3.09	21.64	67.88	7.39	1.53	7.63	14,043	14,491	.....
Total.....	11,861									
Average..		2.19	20.48	70.90	6.43	1.59	6.58	14,365	14,687	.....

## PHILADELPHIA, PA., FRANKFORD ARSENAL.

[Cardiff run of mine, Cardiff mines, Nanty Glo, Pa.; 7,200 tons at \$2.60; 5 per cent ash; 14,200 B. t. u.]

1909.										
October.....	525.79	2.32	.....	.....	.....	.....	6.39	14,371	14,712	\$2.6313
November.....	1,002.69	2.34	.....	.....	.....	.....	6.29	14,385	14,730	2.6339
December.....	<sup>b</sup> 971.53	2.35	.....	.....	.....	.....	6.09	14,444	14,792	2.6447
1910.										
January.....	630.31	2.96	.....	.....	.....	.....	7.05	14,177	14,609	2.5758
February.....	756.66	1.86	.....	.....	.....	.....	6.42	14,469	14,743	2.6493
March.....	<sup>b</sup> 629.04	1.76	.....	.....	.....	.....	7.17	14,318	14,575	2.6016
April.....	732.17	1.80	.....	.....	.....	.....	7.15	14,372	14,635	2.6115
May.....	601.71	1.90	.....	.....	.....	.....	7.62	14,204	14,479	2.5807
June.....	829.34	1.76	.....	.....	.....	.....	6.87	14,378	14,636	2.6326
Total.....	<sup>b</sup> 6,679.24									
Average..		2.12	.....	.....	.....	.....	6.72	14,360	14,671	2.6293

 $\alpha$  Contract based on an estimate of 10,000 tons at \$3.30 for dredge *Delaware* and 6,000 tons at \$2.90 for other dredges, tugs, scows, etc.<sup>b</sup> These tonnages only approximate.

TABLE 9.—Analyses of coals delivered to the Government under contracts, 1909-10—Con.

## PHILADELPHIA, PA., FRANKFORD ARSENAL.

[Imperial run of mine, Viola mine, Osceola Mills, Pa.; 3,000 tons at \$2.75; 6 per cent ash; 14,250 B. t. u.]

Date.	Tons delivered.	Proximate analysis, "as received."					Ash "dry coal."	B. t. u.		Corrected price per ton.
		Mois- ture.	Vola- tile matter.	Fixed carbon.	Ash.	Sul- phur.		"As re- ceived."	"Dry coal."	
1909.										
June.....	1,092.79	3.38	.....	.....	.....	.....	8.29	13,871	14,356	\$2.6569
July.....	929.09	2.61	.....	.....	.....	.....	8.17	14,033	14,409	2.6881
August.....	398.34	2.93	.....	.....	.....	.....	8.93	13,935	14,356	2.6692
Total.....	2,420.22	.....	.....	.....	.....	.....	.....	.....	.....	.....
Average.....	.....	3.01	.....	.....	.....	.....	8.35	13,944	14,377	2.6709

## PHILADELPHIA, PA., MINT BUILDING.

[Star run of mine, Miller bed, Commercial collieries 3, 4, and 5, Twin Rocks, Cambria County, Pa.; 3,500 tons at \$3.04; 5 per cent ash; 14,300 B. t. u.]

1909.										
July.....	142.683	2.31	21.50	70.73	5.46	1.49	5.59	14,486	14,828	\$3.0795
August.....	263.129	1.95	20.75	70.65	6.65	1.65	6.75	14,395	14,675	3.0602
September.....	211.388	2.25	21.00	70.90	5.85	1.78	5.95	14,510	14,855	3.0846
October.....	284.475	1.70	20.50	72.10	5.70	1.70	5.80	14,535	14,790	3.0900
November.....	312.221	2.65	20.50	71.05	5.80	1.85	5.95	14,365	14,750	3.0538
December.....	320.842	2.90	20.00	68.80	8.30	1.75	8.50	13,815	14,225	2.8969
1910.										
January.....	394.897	6.35	18.25	68.05	7.35	2.38	7.90	13,520	14,440	2.8542
February.....	313.259	3.60	19.75	70.45	6.20	1.60	6.45	14,130	14,650	3.0039
March.....	438.420	2.75	19.25	70.40	7.60	1.90	7.85	14,030	14,430	2.9626
April.....	194.667	2.50	19.50	69.75	8.25	1.35	8.45	14,000	14,355	2.9362
May.....	244.982	2.35	20.25	70.95	6.45	1.83	6.65	14,315	14,660	3.0432
June.....	240.971	3.30	19.00	70.35	7.35	1.63	7.60	13,915	14,400	2.9382
Total.....	3,361.934	.....	.....	.....	.....	.....	.....	.....	.....	.....
Average.....	.....	3.05	19.86	70.25	6.84	1.79	7.07	14,121	14,565	2.9819

## ROCHESTER, N. Y., COURTHOUSE AND POST OFFICE.

[Grate anthracite, East Boston mine, Kingston, Pa.; 600 tons at \$6.30; 7.07 per cent ash; 13,449 B. t. u.]

1909.										
October.....	50.000	3.05	4.50	80.85	11.60	0.63	12.10	12,520	12,915	\$5.7448
November.....	50.000	3.10	3.50	82.50	10.90	.50	11.20	12,680	13,080	5.8698
December.....	50.000	3.60	5.00	80.50	10.90	.55	11.30	12,640	13,110	5.8978
1910.										
January.....	50.000	2.80	5.50	82.30	9.40	.45	9.60	13,110	13,490	6.1212
February.....	28.000	3.30	4.50	82.20	10.00	1.10	10.30	12,970	13,410	6.0356
.....	45.000	3.82	4.74	80.93	10.51	.83	10.93	12,774	13,281	5.9438
March.....	27.000	3.00	3.50	84.40	9.10	.68	9.40	13,085	13,490	6.1095
.....	50.000	3.95	6.25	76.40	13.40	.80	13.95	12,200	12,700	5.5349
June.....	15.000	3.35	4.00	82.95	9.70	.65	10.05	12,860	13,315	6.0041
Total.....	365.000	.....	.....	.....	.....	.....	.....	.....	.....	.....
Average.....	.....	3.34	4.74	81.08	10.84	.65	11.21	12,717	13,156	5.8871

TABLE 9.—Analyses of coals delivered to the Government under contracts, 1909-10—Con.

**ROCK ISLAND, ILL., ROCK ISLAND ARSENAL.**[Lehigh egg anthracite; 1,000 tons at \$8.59; 10 per cent ash.<sup>a</sup>]

Date.	Tons delivered.	Proximate analysis, "as received."					Ash "dry coal."	B. t. u.		Corrected price per ton.
		Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.		"As received."	"Dry coal."	
1909.										
September.....	304.24	3.65	.....	.....	.....	.....	11.34	12,794	13,279	<sup>a</sup> \$8.59
December.....	174.06	3.77	.....	.....	.....	.....	12.00	12,598	13,092	8.59
1910.										
January.....	119.82	3.74	.....	.....	.....	.....	10.90	13,129	13,639	8.59
March.....	126.25	4.83	.....	.....	.....	.....	11.52	12,507	13,142	8.59
Total.....	724.37	.....	.....	.....	.....	.....	.....	.....	.....	.....
Average.....		3.90	.....	.....	.....	.....	11.46	12,752	13,270	8.59

**ROCK ISLAND, ILL., ROCK ISLAND ARSENAL.**

[Knickerbocker run of mine, B bed, Knickerbocker mines Nos. 1 and 2, Hooversville, Pa.; 300 tons, at \$4.75; 5 per cent ash, 13,600 B. t. u.]

1909.										
November.....	76.29	2.05	.....	.....	.....	.....	7.45	14,175	14,472	\$4.9308
1910.										
May.....	77.77	1.76	.....	.....	.....	.....	8.80	14,095	14,339	4.8829
Total.....	154.06	.....	.....	.....	.....	.....	.....	.....	.....	.....
Average.....		1.87	.....	.....	.....	.....	8.13	14,134	14,403	4.8965

**ROCK ISLAND, ILL., ROCK ISLAND ARSENAL.**

[Sangamon County run of mine, No. 5 bed, Peerless mine, Springfield, Ill.; 5,000 tons at \$2.12; 12 per cent ash, 10,900 B. t. u.]

1909.										
August.....	252.68	12.65	.....	.....	.....	.....	14.67	10,592	12,126	\$2.0401
September.....	218.67	13.24	.....	.....	.....	.....	14.34	10,598	12,215	2.0413
October.....	358.35	13.51	.....	.....	.....	.....	13.31	10,547	12,194	2.0513
November.....	340.49	14.60	.....	.....	.....	.....	12.60	10,625	12,441	2.0665
December.....	714.68	14.30	.....	.....	.....	.....	14.09	10,457	12,202	2.0138
1910.										
January.....	599.06	14.30	.....	.....	.....	.....	13.93	10,487	12,237	2.0397
February.....	995.63	13.48	.....	.....	.....	.....	13.99	10,576	12,224	2.0570
March.....	1,908.57	13.83	.....	.....	.....	.....	14.28	10,488	12,171	2.0199
April.....	344.64	14.33	.....	.....	.....	.....	14.20	10,443	12,190	2.0111
Total.....	5,732.77	.....	.....	.....	.....	.....	.....	.....	.....	.....
Average.....		13.86	.....	.....	.....	.....	13.79	10,517	12,209	2.0455

**SPRINGFIELD, MASS., SPRINGFIELD ARMORY.**

[Blossburg smokeless run of mine, Morris Run and Spangler mines, Morris Run and Spangler, Cambria County, Pa.; 5,000 tons at \$4.14; 7 per cent ash, 14,400 B. t. u.]

1909.										
November.....	1,850	3.61	.....	.....	.....	.....	7.88	13,848	14,367	\$3.9813
1910.										
January.....	1,200	2.11	.....	.....	.....	.....	9.13	13,860	14,159	3.9648
February.....	900	4.27	.....	.....	.....	.....	8.37	13,710	14,322	3.9416
March.....	400	4.90	.....	.....	.....	.....	8.50	13,520	14,210	3.8870
April.....	200	1.40	.....	.....	.....	.....	7.60	14,270	14,460	4.1026
May.....	600	2.45	.....	.....	.....	.....	9.05	13,805	14,155	3.9489
June.....	250	1.70	.....	.....	.....	.....	9.20	13,850	14,080	3.9619
Total.....	5,400	.....	.....	.....	.....	.....	.....	.....	.....	.....
Average.....		3.18	.....	.....	.....	.....	8.47	13,814	14,268	3.9715

<sup>a</sup> Variations from the standard percentage of ash exceeding 2 and less than 2.5 above or below to cause deduction or addition of 8 cents per ton; for each additional one-half of 1 per cent, or fraction thereof, 2 cents more per ton to be deducted or added.

TABLE 9.—*Analyses of coals delivered to the Government under contracts, 1909-10—Con.***ST. LOUIS, MO., CUSTOMHOUSE.**

[Staunton lump, through 2 inches and over 1½ inches round openings, No. 6 bed, Staunton No. 2 mine, Staunton, Ill.; 4,500 tons at \$2.20; 10 per cent ash, 12,585 B. t. u.]

Date.	Tons delivered.	Proximate analysis, "as received."					Ash "dry coal."	B. t. u.		Corrected price per ton.
		Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.		"As received."	"Dry coal."	
<b>1909.</b>										
July.....	283.810	11.67	37.99	39.47	10.87	3.29	12.30	10,943	12,389	\$1.8930
August.....	333.136	11.50	37.75	40.25	10.50	3.53	11.80	11,035	12,470	1.9290
September.....	230.603	11.90	36.75	41.45	9.90	3.75	11.30	11,020	12,510	1.9264
October.....	235.589	11.80	37.50	38.95	11.75	3.75	13.30	10,765	12,200	1.8418
November.....	221.800	11.90	36.75	40.10	11.25	3.23	12.75	10,840	12,310	1.8750
December.....	392.726	10.00	36.75	38.35	14.90	3.95	16.50	10,470	11,630	1.6503
<b>1910.</b>										
January.....	469.762	10.05	37.50	39.05	13.40	4.80	14.90	10,765	11,970	1.8118
February.....	178.055	11.05	37.25	39.35	12.35	4.15	13.85	10,795	12,135	1.8471
March.....	469.724	10.35	36.75	39.55	13.35	4.15	14.75	10,870	12,055	1.8302
April.....	137.728	10.60	35.25	42.80	11.35	2.83	12.65	11,135	12,455	1.9265
May.....	110.068	7.80	37.00	44.75	10.45	3.48	11.35	11,820	12,815	2.0663
June.....	221.493	12.03	34.31	38.79	14.87	4.44	16.91	10,238	11,638	1.6097
Total.....	3,284.494									
Average.....		10.89	36.93	39.80	12.38	3.90	13.89	10,828	12,151	1.8530

**SYRACUSE, N. Y., COURTHOUSE AND POST OFFICE.**

[Egg anthracite, through 2½ inches and over 2 inches square openings, Cornell mine, Bernice, Pa.; 300 tons at \$5.80; 6.62 per cent ash, 13,700 B. t. u.]

<b>1909.</b>										
November.....	33	2.00	12.00	72.50	13.50	.65	13.80	12,870	13,140	\$5.1986
December.....	46	2.00	8.50	70.20	19.30	.65	19.70	11,940	12,180	4.7049
<b>1910.</b>										
January.....	78	2.70	7.75	77.50	12.05	.55	12.40	13,140	13,500	5.4429
February.....	40	1.85	9.00	69.35	19.80	.60	20.15	11,910	12,135	4.6922
March.....	54	1.75	8.50	73.40	16.35	.53	16.70	12,540	12,765	4.9589
May.....	16	1.75	8.75	75.10	14.40	.58	14.65	12,820	13,045	5.0944
Total.....	267									
Average.....		2.12	8.80	73.43	15.65	.58	15.99	12,575	12,847	4.9737

**TOLEDO, OHIO, CUSTOMHOUSE.**

[Pocahontas smokeless, over 3" round opening, Greenbrier mine; or over 3" square opening, Louisville mine; Big Vein or No. 3 bed, Mercer and McDowell Counties, W. Va.; 500 tons at \$3.80; 4.38 per cent ash, 15,300 B. t. u.]

<b>1909.</b>										
July.....	36.830	3.78	16.99	74.98	4.25	0.55	4.42	14,610	15,184	\$3.6286
September.....	38.325	3.15	18.00	74.75	4.10	.55	4.25	14,675	15,155	3.6448
November.....	38.486	4.80	17.75	76.80	3.65	.45	3.75	14,755	15,105	3.6646
December.....	37.325	1.80	18.00	76.10	4.10	.95	4.20	14,760	15,040	3.6659
	33.968	2.50	18.00	74.75	4.75	.90	4.85	14,665	15,035	3.6423
<b>1910.</b>										
January.....	36.204	4.55	17.00	74.30	4.15	.53	4.35	14,450	15,140	3.5889
February.....	19.182	4.70	17.50	73.60	4.20	1.20	4.40	14,390	15,090	3.5740
March.....	38.928	4.10	17.50	73.10	5.30	.45	5.50	14,300	14,910	3.5516
April.....	23.812	2.60	16.50	75.50	5.40	.60	5.50	14,490	14,870	3.5988
May.....	32.160	2.35	18.00	73.50	6.15	.70	6.35	14,350	14,690	3.5641
Total.....	335.220									
Average.....		3.08	17.56	74.79	4.57	.66	4.72	14,557	15,020	3.6155

TABLE 9.—Analyses of coals delivered to the Government under contracts, 1909–10—Con.

## WASHINGTON, D. C., DEPARTMENT OF AGRICULTURE, 1304 B STREET.

[Morea and Lehigh Valley egg anthracite; 100 tons at \$5.97; 10 per cent ash.]

Date.	Tons delivered.	Proximate analysis, "as received."					Ash "dry coal."	B. t. u.		Corrected price per ton.
		Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.		"As received."	"Dry coal."	
1909.										
November.....	10						11.50			\$5.97
	15						14.90			5.73
December.....	15						13.60			5.73
January.....	15						11.20			5.97
February.....	15						10.40			5.97
March.....	10						12.60			5.79
Total.....	80									
Average.....							12.41			5.82

## WASHINGTON, D. C., DEPARTMENT OF AGRICULTURE, BUREAU OF CHEMISTRY.

[Lee Lyth or William Penn broken anthracite, Susquehanna mines, Luzerne and Schuylkill Counties, Pa.; 1,000 tons <sup>a</sup> at \$5.45; 10 per cent ash.]

1909.										
July.....	25						9.79			\$5.45
August.....	25						9.58			5.45
September.....	44						10.74			5.45
October.....	56						8.70			5.45
November.....	25						12.00			5.45
	75						8.77			5.45
December.....	75						10.30			5.45
1910.										
January.....	100						10.73			5.45
February.....	100						9.65			5.45
March.....	25						8.70			5.45
April.....	25						8.00			5.60
May.....	15						9.60			5.45
Total.....	590									
Average.....							9.77			5.45

## WASHINGTON, D. C., DEPARTMENT OF AGRICULTURE, MAIN BUILDING.

[New River run of mine, Sewell bed, Loup Creek mines, Fayette County, W. Va.; 6,000 tons at \$3.10; 5 per cent ash, 14,750 B. t. u.]

1909.										
September.....	100	2.48					3.58	14,808	15,163	\$3.1222
October.....	25	2.40					4.70	14,630	14,980	3.0748
	100	2.36					4.38	14,698	15,050	3.0891
	200	2.11					3.73	14,793	15,115	3.1190
November.....	200	2.34					3.99	14,716	15,068	3.1029
	200	2.61					3.86	14,676	15,069	3.0944
December.....	200	2.90					5.20	14,420	14,840	3.0306
	200	3.13					5.00	14,436	14,902	3.0340
	500	2.29					4.59	14,612	14,954	3.0710
January.....	500	2.45					4.26	14,646	15,014	3.0781
February.....	500	2.32					3.91	14,741	15,091	3.1081
March.....	300	1.61					4.32	14,742	14,985	3.0983
April.....	300	1.69					4.76	14,695	14,948	3.0884
May.....	300	2.51					5.24	14,507	14,881	3.0489
	100	2.32					4.83	14,568	14,914	3.0617
June.....	100	2.85					6.42	14,208	14,620	2.9861
	25	2.10					5.70	14,390	14,700	3.0243
Total.....	3,850									
Average.....		2.34					4.47	14,635	14,986	3.0758

<sup>a</sup> Contract based on an estimate of 1,000 tons of furnace anthracite for main buildings.

TABLE 9.—*Analyses of coals delivered to the Government under contracts, 1909–10—Con.***WASHINGTON, D. C., DEPARTMENT OF AGRICULTURE, 221 THIRTEEN-AND-A-HALF STREET.**[Lee Lyth or William Penn broken anthracite, Susquehanna mines, Luzerne and Schuylkill Counties, Pa.; 1,000 tons, <sup>a</sup> at \$5.45, 10 per cent ash.]

Date.	Tons delivered.	Proximate analysis, "as received."					Ash "dry coal."	B. t. u.		Corrected price per ton.
		Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.		"As received."	"Dry coal."	
1909.										
October.....	25						9.70			\$5.45
1910.										
January.....	25						10.10			5.45
February.....	25						14.20			5.21
March.....	25						10.24			5.45
April.....	10						7.80			5.60
Total.....	110									
Average.....							10.76			5.45

**WASHINGTON, D. C., DEPARTMENT OF AGRICULTURE, WEATHER BUREAU.**

[Lee Lyth or William Penn broken anthracite, Susquehanna mines, Luzerne and Schuylkill Counties, Pa.; 800 tons, at \$5.65, 10 per cent ash.]

1909.										
October.....	50.00						11.55			\$5.65
November.....	50.00						9.30			5.65
December.....	50.13						8.90			5.65
1910.										
January.....	50.42						10.10			5.65
	50.00						12.15			5.50
February.....	49.61						10.40			5.65
March.....	50.10						8.20			5.65
May.....	50.23						8.45			5.65
Total.....	400.49									
Average.....							9.88			5.65

**WASHINGTON, D. C., DEPARTMENT OF COMMERCE AND LABOR, BUREAU OF STANDARDS.**

[Philadelphia &amp; Reading No. 1 buckwheat anthracite; 1,500 tons, at \$4.40; 18 per cent ash.]

1909.										
July.....	50.71						20.85			\$4.19
	100.00						18.64			4.40
August.....	151.46						19.97			4.32
October.....	150.00						17.13			4.40
November.....	140.00						16.63			4.44
December.....	205.58						17.80			4.40
	158.59						20.69			4.19
1910.										
January.....	110.42						19.47			4.36
	212.81						20.33			4.26
February.....	204.48						18.22			4.40
March.....	117.18						22.47			3.92
April.....	221.08						19.64			4.32
May.....	256.57						18.18			4.40
June.....	161.38						17.18			4.40
Total.....	2,240.26									
Average.....							18.98			4.40

<sup>a</sup> Contract based on an estimate of 1,000 tons of furnace anthracite for main buildings.

TABLE 9.—Analyses of coals delivered to the Government under contracts, 1909-10—Con.

## WASHINGTON, D. C., DEPARTMENT OF COMMERCE AND LABOR, CENSUS BUREAU.

[Morea and Lehigh Valley egg anthracite; 350 <sup>a</sup> tons, at \$5.93; 10 per cent ash.]

Date.	Tons delivered.	Proximate analysis, "as received."					Ash "dry coal."	B. t. u.		Corrected price per ton.
		Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.		"As received."	"Dry coal."	
1909.										
October.....	100.00						11.95			\$5.93
December.....	111.83						12.84			5.75
1910.										
January.....	100.00						10.89			5.93
February.....	100.00						11.08			5.93
March.....	50.00						11.58			5.93
June.....	24.92						10.07			5.93
Total.....	486.75									
Average.....							11.62			5.93

## WASHINGTON, D. C., DEPARTMENT OF COMMERCE AND LABOR, WILLARD BUILDING.

[Broken anthracite; 165 tons, at \$5.59; 10 per cent ash.]

1909.										
October.....	25						9.70			\$5.59
November.....	15						11.00			5.59
December.....	25						13.30			5.38
1910.										
January.....	25						13.40			5.38
February.....	25						9.50			5.59
March.....	25						10.10			5.59
June.....	5						10.00			5.59
Total.....	145									
Average.....							11.14			5.59

## WASHINGTON, D. C., NATIONAL BOTANIC GARDENS.

[Morea and Lehigh Valley broken anthracite; 350 tons, at \$5.47; 10 per cent ash.]

1909.										
November.....	100						9.10			\$5.47
December.....	101						9.63			5.47
1910.										
February.....	150						8.93			5.47
April.....	28						6.91			5.68
Total.....	379									
Average.....							9.01			5.47

<sup>a</sup> Contract based on an estimate of 350 tons of egg anthracite coal for Census Buildings.



## RESULTS OF ANALYSES.

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TABLE 9.—*Analyses of coals delivered to the Government under contracts, 1909-10—Con.***WASHINGTON, D. C., GOVERNMENT PRINTING OFFICE.**

[Egg anthracite; 9,000 tons, at \$5.79; 10 per cent ash.]

Date.	Tons delivered.	Proximate analysis, "as received."					Ash "dry coal."	B. t. u.		Corrected price per ton.
		Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.		"As received."	"Dry coal."	
1909.										
July.....	538.00						12.03			\$5.64
September.....	500.00						11.33			5.79
October.....	520.83						11.99			5.79
November.....	510.03						11.60			5.79
December.....	498.98						11.64			5.79
.....	400.00						11.42			5.79
.....	502.00						11.32			5.79
1910.										
January.....	507.24						11.36			5.79
.....	521.77						11.43			5.79
.....	532.63						11.37			5.79
February.....	493.12						11.79			5.79
.....	505.04						10.91			5.79
March.....	506.62						11.50			5.79
April.....	495.87						11.31			5.79
May.....	505.70						10.58			5.79
June.....	511.63						10.90			5.79
July.....	496.92						11.51			5.79
August.....	500.62						10.51			5.79
.....	499.83						10.75			5.79
Total.....	9,546.83									
Average.....							11.33			5.79

**WASHINGTON, D. C., CONGRESS, LIBRARY OF CONGRESS.**

[Susquehanna broken anthracite, Nanticoke, Pa.; 3,700 tons, at \$5.43; 10 per cent ash.]

1909.										
July.....	60.00						11.68			5.43
August.....	1,152.19						9.77			5.43
December.....	1,514.00						10.00			5.43
1910.										
February.....	1,034.89						9.46			5.43
June.....	170.18						8.60			5.43
Total.....	3,931.26									
Average.....							9.76			5.43

**WASHINGTON, D. C., INTERIOR DEPARTMENT, FREEDMEN'S HOSPITAL.**

[Phialadelphia &amp; Reading egg anthracite; 25 tons at \$6.15; 10 per cent ash.]

1909										
July.....	6						10.69			\$6.15
September.....	6						15.60			5.91
1910.										
January.....	10						12.10			6.00
April.....	8						10.60			6.15
June.....	8						11.15			6.15
Total.....	38									
Average.....							11.91			6.15

TABLE 9.—Analyses of coals delivered to the Government under contracts, 1909–10—Con.

## WASHINGTON, D. C., INTERIOR DEPARTMENT, FREEDMEN'S HOSPITAL.

[Elk Lick run of mine, Pittsburg or Georges Creek bed, West Salisbury, Pa.; 1,925 tons at \$3.11; 7 per cent ash, 14,000 B. t. u.]

Date.	Tons delivered.	Proximate analysis, "as received."					B. t. u.			Corrected price per ton.
		Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.	Ash "dry coal."	"As received."	"Dry coal."	
1909.										
August.....	50	2.00					9.00	13,905	14,189	\$3.0889
September.....	50	2.22					8.58	13,988	14,300	3.1073
October.....	200	1.70					9.40	13,978	14,216	3.0851
November.....	200	2.00					8.90	14,030	14,310	3.1167
December.....	200	3.50					9.45	13,631	14,125	3.0080
	100	2.24					10.09	13,766	14,081	3.0180
1910.										
January.....	300	2.95					9.73	13,758	14,174	3.0362
	100	3.21					10.80	13,490	13,937	2.9567
February.....	200	3.24					10.62	13,516	13,969	2.9625
March.....	200	3.13					9.91	13,652	14,093	3.0127
	125	1.93					9.93	13,845	14,116	3.0556
April.....	50	1.98					10.76	13,720	13,997	3.0078
May.....	50	3.11					10.74	13,537	13,972	2.9671
Total....	1,825									
Average..		2.66					9.79	13,755	14,131	3.0356

## WASHINGTON, D. C., INTERIOR DEPARTMENT, GENERAL LAND OFFICE.

[Big Vein Georges Creek run of mine, Big Vein (Pittsburg) bed, Ocean mine, Allegany Co., Md.; 4,000 tons at \$3.50; 7 per cent ash, 14,250 B. t. u.]

1909.										
July.....	300	1.16					7.68	14,310	14,477	\$3.5147
August.....	300	1.33					7.64	14,365	14,559	3.5282
September.....	300	1.77					7.74	14,259	14,515	3.5022
October.....	300	1.30					7.43	14,341	14,530	3.5224
November.....	300	1.70					7.80	14,170	14,420	3.4804
December.....	300	2.59					9.24	13,846	14,214	3.3808
1910.										
January.....	300	2.47					8.52	14,002	14,357	3.4391
	300	2.89					7.66	14,089	14,508	3.4605
February.....	300	2.13					7.98	14,163	14,472	3.4786
March.....	300	1.52					7.85	14,238	14,458	3.4971
April.....	300	1.65					8.81	14,098	14,334	3.4627
May.....	300	1.60					8.05	14,169	14,399	3.4801
June.....	100	1.45					7.59	14,237	14,451	3.4968
Total....	3,700									
Average..		1.83					8.02	14,173	14,437	3.4811

## WASHINGTON, D. C., INTERIOR DEPARTMENT, GOVERNMENT HOSPITAL FOR THE INSANE.

[Stove anthracite; 1,000 tons at \$5.62; 12 per cent ash.]

1909.										
December.....	665						12.66			\$5.62
1910.										
May.....	700						13.45			5.62
June.....	35						14.70			5.44
Total....	a 1,400									
Average..							13.11			5.62

a Deliveries amounted to 40 cars, estimated at 35 tons each.

TABLE 9.—Analyses of coals delivered to the Government under contracts, 1909-10—Con.

**WASHINGTON, D. C., INTERIOR DEPARTMENT, GOVERNMENT HOSPITAL FOR THE INSANE.**

[Georges Creek run of mine, Pittsburg, or 14-foot bed, Washington Nos. 1 and 2 and Borden mine, Eckhart and Borden yard, Md.; 20,000 tons at \$3; 7½ per cent ash; 14,300 B. t. u.]

Date.	Tons delivered.	Proximate analysis, "as received."					Ash "dry coal."	B. t. u.		Corrected price per ton.
		Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.		"As received."	"Dry coal."	
1909.										
August.....	665	2.35					8.64	13,942	14,278	\$2.9249
September.....	665	2.83					9.25	13,771	14,188	2.8890
October.....	1,015	2.88					8.76	13,809	14,218	2.8970
November.....	1,435	2.80					9.36	13,648	14,041	2.8632
December.....	1,365	3.48					10.72	13,370	13,852	2.7649
1910.										
January.....	3,325	3.90					9.10	13,639	14,192	2.8613
February.....	2,450	2.99					9.91	13,657	14,078	2.8451
March.....	1,785	2.37					10.41	13,624	13,954	2.8382
April.....	1,190	2.24					6.82	14,304	14,632	3.0008
May.....	1,120	2.35					7.39	14,168	14,509	2.9723
June.....	1,540	2.32					7.18	14,197	14,534	2.9784
July.....	1,050	2.23					7.94	14,112	14,434	2.9606
Total.....	<sup>a</sup> 17,605									
Average.....		2.89					8.96	13,802	14,213	2.8955

**WASHINGTON, D. C., INTERIOR DEPARTMENT, HOWARD UNIVERSITY.**

[Mahanoy Thomas, Philadelphia & Reading broken, anthracite, Mammoth bed; 200 tons at \$5.80; 10 per cent ash.]

1909.										
August.....	19						13.92			\$5.56
September.....	25						11.30			5.80
October.....	5						10.80			5.80
December.....	25						11.80			5.80
1910.										
January.....	31						10.80			5.80
February.....	4						12.40			5.65
Total.....	109									
Average.....							11.75			5.80

**WASHINGTON, D. C., INTERIOR DEPARTMENT, HOWARD UNIVERSITY.**

[Girard Mammoth, stove anthracite, Buck Mountain bed, Schuylkill County, Pa.; 125 tons, at \$6.75; 12 per cent ash.]

1909.										
September.....	15						11.90			\$6.75
October.....	5						11.30			6.75
November.....	25						12.30			6.75
	15						10.20			6.75
Total.....	60									
Average.....							11.59			6.75

<sup>a</sup> Deliveries amounted to 503 cars, estimated at 35 tons each.

TABLE 9.—Analyses of coals delivered to the Government under contracts, 1909–10—Con.

**WASHINGTON, D. C., INTERIOR DEPARTMENT, PENSION OFFICE.**

[Morea and Lehigh Valley, broken anthracite; 975 tons, at \$5.58; 10 per cent ash.]

Date.	Tons delivered.	Proximate analysis, "as received."					Ash "dry coal."	B. t. u.		Corrected price per ton.
		Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.		"As received."	"Dry coal."	
1909.										
October.....	150						11.33			\$5.58
November.....	100						10.40			5.58
December.....	200						11.80			5.58
1910.										
January.....	200						9.60			5.58
March.....	200						9.06			5.58
Total.....	850									
Average..							10.39			5.58

**WASHINGTON, D. C., INTERIOR DEPARTMENT, CIVIL SERVICE COMMISSION.**

[Mahanoy Thomas, Philadelphia &amp; Reading, broken anthracite, Mammoth bed; 250 tons, at \$5.61; 10 per cent ash.]

Date.	Tons delivered.	Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.	Ash "dry coal."	"As received."	"Dry coal."	Corrected price per ton.
1909.										
August.....	20						14.00			\$5.37
October.....	30						12.30			5.46
November.....	20						13.40			5.40
December.....	15						11.50			5.61
1910.										
January.....	30						11.20			5.61
February.....	30						14.10			5.37
March.....	30						15.00			5.37
April.....	20						11.60			5.61
June.....	15						12.75			5.43
Total.....	210									
Average..							12.96			5.43

**WASHINGTON, D. C., INTERIOR DEPARTMENT, UNITED STATES GEOLOGICAL SURVEY.**

[Morea and Lehigh Valley, broken anthracite; 600 tons, at \$5.73; 10 per cent ash.]

Date.	Tons delivered.	Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.	Ash "dry coal."	"As received."	"Dry coal."	Corrected price per ton.
1909.										
August.....	40						10.98			\$5.73
October.....	20						12.10			5.58
November.....	50.14						12.18			5.58
December.....	50						11.55			5.73
1910.										
January.....	100						11.05			5.73
February.....	100						10.46			5.73
April.....	30						8.60			5.73
May.....	25						8.46			5.73
Total.....	445.14									
Average..							10.75			5.73

TABLE 9.—*Analyses of coals delivered to the Government under contracts, 1909-10—Con.***WASHINGTON, D. C., DEPARTMENT OF JUSTICE, 1435 K STREET.**

[Philadelphia &amp; Reading egg anthracite; 135 tons at \$5.90; 10 per cent ash.]

Date.	Tons delivered.	Proximate analysis, "as received."					Ash "dry coal."	B. t. u.		Corrected price per ton.
		Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.		"As received."	"Dry coal."	
1909.										
August.....	30.00						11.41			\$5.90
November.....	10.00						9.20			5.90
December.....	31.16						14.70			5.66
1910.										
January.....	30.00						12.60			5.72
February.....	30.81						10.70			5.90
March.....	20.43						11.10			5.90
June.....	2.00						12.00			5.90
Total.....	154.40									
Average..							11.99			5.90

**WASHINGTON, D. C., DEPARTMENT OF JUSTICE, UNITED STATES JAIL.**

[Star run of mine, Miller bed, Cambria County, Pa.; 400 tons at \$3.19; 5 per cent ash; 14,250 B. t. u.]

1909.										
July.....	33.00	1.24					6.47	14,510	14,692	\$3.2482
September.....	400.00	1.85					7.45	14,322	14,591	3.1861
1910.										
May.....	149.66	1.91					8.88	14,036	14,321	3.1021
Total.....	582.66									
Average..		1.83					7.76	14,259	14,525	3.1720

**WASHINGTON, D. C., NAVY DEPARTMENT, MILLS BUILDING.**

[No. 1 buckwheat anthracite; 450 tons at \$3.45; 18 per cent ash.]

1909.										
September.....	50.00						18.80			\$3.45
October.....	53.16						17.45			3.45
November.....	48.86						18.20			3.45
December.....	63.30						22.35			2.97
1910.										
January.....	49.49						24.02			2.97
February.....	61.25						17.38			3.45
March.....	53.04						18.35			3.45
April.....	45.59						17.95			3.45
May.....	23.08						17.40			3.45
Total.....	447.77									
Average..							19.24			3.41

TABLE 9.—Analyses of coals delivered to the Government under contracts, 1909–10—Con.

**WASHINGTON, D. C., NAVY DEPARTMENT, NAVAL MEDICAL SCHOOL HOSPITAL.**

[Big Vein Georges Creek, run of mine, Big Vein (Pittsburg) bed, Ocean No. 7 and Hoffman mines, Frostburg, Md.; 3,000 tons at \$3.47; 7 per cent ash; 1 per cent sulphur, 14,250 B. t. u.]

Date.	Tons delivered.	Proximate analysis, "as received."					Ash "dry coal."	B. t. u.		Corrected price per ton.
		Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.		"As received."	"Dry coal."	
1909.										
July.....	75.00	1.66					9.53	13,863	14,097	\$3.3558
	34.93	2.17					8.12	14,069	14,381	3.4259
August.....	81.55	1.82					8.07	14,153	14,416	3.4464
	62.25	1.49					9.99	13,857	14,067	3.3543
September.....	95.49	1.99					8.98	14,005	14,287	3.4103
October.....	89.31	2.00					8.20	14,103	14,391	3.4342
November.....	90.99	1.70					8.97	14,000	14,238	3.4091
	76.77	1.50					8.30	14,140	14,340	3.4432
December.....	101.24	2.03					8.03	14,127	14,420	3.4400
	42.67	2.70					10.90	13,610	13,980	3.2742
1910.										
January.....	157.06	2.79					9.35	13,725	14,118	3.3222
February.....	172.46	3.00					9.54	13,740	14,165	3.3258
March.....	215.00	3.07					9.15	13,737	14,172	3.3251
April.....	74.50	2.20					9.30	13,910	14,220	3.3672
May.....	77.89	2.34					9.26	13,868	14,200	3.3570
June.....	119.92	2.82					9.77	13,671	14,076	3.3090
Total.....	1,567.03									
Average..		2.38					9.10	13,880	14,218	3.3599

**WASHINGTON, D. C., NAVY YARD.**

[Stanton or Thomas, No. 1 buckwheat anthracite; 15,000 tons, at \$2.83; 18 per cent ash.]

Date.	Tons delivered.	Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.	Ash "dry coal."	B. t. u.	Corrected price per ton.
1909.									
October.....	2,588.14						19.71		\$2.75
November.....	5,457.02						15.25		2.93
1910.									
March.....	7,239.09						20.41		2.69
Total.....	15,284.25								
Average..							18.45		2.83

**WASHINGTON, D. C., NAVY YARD.**

[Susquehanna, No. 1 buckwheat anthracite; 15,000 tons, at \$2.85; 18 per cent ash.]

Date.	Tons delivered.	Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.	Ash "dry coal."	B. t. u.	Corrected price per ton.
1909.									
September.....	2,496.46						20.73		\$2.64
October.....	5,093.26						20.81		2.64
November.....	2,517.00						15.98		2.93
1910.									
February.....	5,037.38						17.41		2.85
Total.....	15,144.10								
Average..							18.86		2.85

TABLE 9.—Analyses of coals delivered to the Government under contracts, 1909–10—Con.

## WASHINGTON, D. C., NAVY DEPARTMENT, UNITED STATES NAVAL OBSERVATORY.

[Philadelphia &amp; Reading broken anthracite; 600 tons, at \$6.10; 10 per cent ash.]

Date.	Tons delivered.	Proximate analysis, "as received."					Ash "dry coal."	B. t. u.		Corrected price per ton.
		Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.		"As received."	"Dry coal."	
1909.										
September.....	182.00						11.26			\$6.10
November.....	40.27						9.20			6.10
December.....	39.97						11.35			6.10
	56.08						11.30			6.10
1910.										
January.....	106.38						10.45			6.10
February.....	100.08						9.38			6.10
March.....	25.72						10.70			6.10
June.....	90.00						9.28			6.10
Total.....	640.50									
Average..							10.41			6.10

## WASHINGTON, D. C., POST OFFICE DEPARTMENT, POST OFFICE ANNEX.

[Pea anthracite; 400 tons, at \$4.10; 16 per cent ash.]

1909.										
October.....	25.00						16.00			\$4.10
November.....	26.32						16.00			4.10
	14.23						16.20			4.10
December.....	35.77						13.00			4.25
	50.00						15.73			4.10
1910.										
January.....	100.00						15.37			4.10
March.....	50.00						16.22			4.10
May.....	10.00						16.05			4.10
June.....	10.00						15.30			4.10
Total.....	321.32									
Average..							15.45			4.10

## WASHINGTON, D. C., POST OFFICE DEPARTMENT, POST OFFICE BUILDING.

[New River run of mine, Sewell bed, Loup Creek mines, Fayette County, W. Va.; 4,500 tons, at \$3.34; 5 per cent ash; 14,700 B. t. u.]

1909.										
August.....	300	1.91					4.15	14,783	15,071	\$3.3589
September.....	500	2.05					4.49	14,683	14,989	3.3361
October.....	500	2.34					4.35	14,638	14,989	3.3259
November.....	500	2.27					4.81	14,537	14,875	3.3030
December.....	500	2.71					4.98	14,505	14,909	3.2957
1910.										
February.....	500	2.93					5.10	14,452	14,888	3.2837
March.....	500	2.49					6.03	14,370	14,736	3.2650
April.....	500	2.54					5.10	14,505	14,885	3.2957
May.....	300	2.64					4.81	14,539	14,933	3.3034
Total.....	4,100									
Average..		2.45					4.91	14,547	14,912	3.3052

TABLE 9.—Analyses of coals delivered to the Government under contracts, 1909–10—Con.

**WASHINGTON, D. C., SMITHSONIAN INSTITUTION, NATIONAL ZOOLOGICAL PARK.**

[Broken anthracite; 95 tons, at \$6.40; 10 per cent ash.]

Date.	Tons delivered.	Proximate analysis, "as received."					Ash "dry coal."	B. t. u.		Corrected price per ton.
		Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.		"As received."	"Dry coal."	
1909.										
October.....	30.00						14.60			\$6.16
December.....	5.30						12.30			6.25
	16.81						9.30			6.40
1910.										
January.....	11.25						12.40			6.25
	5.06						14.40			6.16
February.....	15.00						9.90			6.40
March.....	5.00						11.60			6.40
April.....	5.00						9.40			6.40
June.....	15.00						10.00			6.40
Total.....	108.42									
Average..							11.75			6.40

**WASHINGTON, D. C., SMITHSONIAN INSTITUTION, NATIONAL ZOOLOGICAL PARK.**

[New River run of mine, Sewell bed, New River district, W. Va.; 300 tons at \$3.90; 5 per cent ash, 14,700 B. t. u.]

1909.										
October.....	95.00	3.43					3.70	14,644	15,164	\$3.8951
1910.										
January.....	82.42	3.56					5.30	14,360	14,890	3.8098
March.....	96.48	2.10					6.03	14,447	14,757	3.8329
Total.....	273.90									
Average..		3.00					5.00	14,489	14,937	3.8440

**WASHINGTON, D. C., SMITHSONIAN INSTITUTION, NEW NATIONAL MUSEUM.**

[New River nut and slack, Sewell bed, on Loup Creek, Fayette County, W. Va.; 3,000 tons at \$3.25; 5 per cent ash, 14,750 B. t. u.]

1909.										
October.....	1,150	2.42					5.06	14,473	14,832	\$3.1890
December.....	1,000	3.12					5.28	14,381	14,844	3.1687
1910.										
February.....	500	2.32					6.17	14,366	14,708	3.1654
April.....	500	2.62					5.26	14,489	14,878	3.1925
Total.....	3,150									
Average..		2.66					5.34	14,429	14,823	3.1793

**WASHINGTON, D. C., STATE, WAR, AND NAVY BUILDING.**

[Philadelphia &amp; Reading No. 1 buckwheat anthracite; 4,000 tons at \$3.45; 18 per cent ash.]

1909.										
September.....	251.50						16.17			\$3.51
November.....	250.00						14.59			3.57
	253.41						17.00			3.49
December.....	250.36						15.91			3.53
1910.										
January.....	504.35						18.41			3.45
February.....	504.39						18.15			3.45
March.....	501.85						19.55			3.37
May.....	228.28						16.46			3.51
Total.....	2,744.14									
Average..							17.50			3.45



TABLE 9.—Analyses of coals delivered to the Government under contracts, 1909-10—Con.

## WASHINGTON, D. C., STATE, WAR, AND NAVY BUILDING.

[Elk Lick run of mine, Pittsburg or Georges Creek bed, West Salisbury, Pa.; 2,000 tons at \$3.12; 7 per cent ash, 14,000 B. t. u.]

Date.	Tons delivered.	Proximate analysis, "as received."					Ash "dry coal."	B. t. u.		Corrected price per ton.
		Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.		"As received."	"Dry coal."	
1909.										
August.....	102.00	2.74	.....	.....	.....	.....	9.43	13,867	14,258	\$3.0704
November.....	75.00	1.90	.....	.....	.....	.....	9.55	13,900	14,165	3.0777
December.....	78.79	1.90	.....	.....	.....	.....	10.43	13,790	14,060	3.0332
	77.56	2.50	.....	.....	.....	.....	11.10	13,580	13,920	2.9564
	76.89	3.53	.....	.....	.....	.....	10.60	13,543	14,038	2.9782
1910.										
January.....	76.32	3.30	.....	.....	.....	.....	10.10	13,640	14,105	2.9998
February.....	51.03	2.40	.....	.....	.....	.....	9.86	13,723	14,061	3.0383
	51.64	2.60	.....	.....	.....	.....	10.00	13,710	14,070	3.0354
March.....	53.89	2.80	.....	.....	.....	.....	9.59	13,876	14,276	3.0724
	51.21	1.10	.....	.....	.....	.....	11.30	13,670	13,820	2.9765
April.....	50.91	1.80	.....	.....	.....	.....	11.30	13,750	14,000	2.9943
	52.62	1.93	.....	.....	.....	.....	11.62	13,633	13,901	2.9682
June.....	100.00	4.10	.....	.....	.....	.....	10.53	13,494	14,071	2.9672
Total.....	897.86	.....	.....	.....	.....	.....	.....	.....	.....	.....
Average.....		2.63	.....	.....	.....	.....	10.36	13,701	14,071	3.0134

## WASHINGTON, D. C., TREASURY DEPARTMENT, BUREAU OF ENGRAVING AND PRINTING.

[New River run of mine, Sewell bed, Loup Creek mine, Fayette County, W. Va.; 8,500 tons, at \$3.04; 5 per cent ash, 14,750 B. t. u.]

1909.										
July.....	394.353	1.65	22.30	71.93	4.12	0.86	4.19	14,718	14,966	\$3.0334
August.....	740.902	1.74	22.35	70.88	5.03	.87	5.11	14,592	14,850	3.0074
September.....	106.107	1.94	22.21	71.37	4.48	.72	4.56	14,693	14,987	3.0283
October.....	583.290	1.80	22.36	71.83	4.01	.76	4.09	14,757	15,028	3.0414
November.....	884.705	2.02	22.24	71.49	4.25	.75	4.34	14,700	15,000	3.0297
December.....	452.022	2.26	22.26	70.51	4.97	.87	5.08	14,522	14,858	2.9930
1910.										
January.....	832.625	2.67	22.15	70.29	4.89	.88	5.02	14,516	14,914	2.9918
February.....	533.054	2.60	21.85	70.68	4.87	.89	5.02	14,481	14,868	2.9846
March.....	630.415	1.94	21.96	70.10	6.00	.86	6.14	14,400	14,685	2.9679
April.....	725.116	2.57	20.81	71.44	5.18	.81	5.32	14,490	14,871	2.9864
May.....	376.853	2.97	21.03	70.36	5.64	.83	5.82	14,313	14,751	2.9499
June.....	443.549	2.44	21.64	70.30	5.62	.97	5.76	14,371	14,730	2.9619
Total.....	6,702.991	.....	.....	.....	.....	.....	.....	.....	.....	.....
Average.....		2.22	21.94	70.92	4.92	.84	5.04	14,547	14,877	2.9982

## WASHINGTON, D. C., TREASURY DEPARTMENT, BUTLER BUILDING.

[Morea and Lehigh Valley broken anthracite; 250 tons, at \$5.57; 10 per cent ash.]

1909.										
October.....	40	.....	.....	.....	.....	.....	13.65	.....	.....	\$5.33
December, and January, 1910	80	3.49	4.29	82.60	9.62	0.50	9.94	12,948	13,416	5.57
1910.										
March.....	40.246	3.15	6.00	82.15	8.70	.80	8.95	13,275	13,705	5.57
Total.....	160.246	.....	.....	.....	.....	.....	.....	.....	.....	.....
Average.....		3.38	4.86	82.45	9.31	.60	10.62	13,057	13,514	5.57

TABLE 9.—Analyses of coals delivered to the Government under contracts, 1909–10—Con.

**WASHINGTON, D. C., TREASURY DEPARTMENT, TREASURY BUILDING.**

[Philadelphia &amp; Reading No. 1 buckwheat anthracite; 1,200 tons, at \$3.45; 18 per cent ash.]

Date.	Tons delivered.	Proximate analysis, "as received."					Ash "dry coal."	E. t. u.		Corrected price per ton.
		Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.		"As received."	"Dry coal."	
1910.										
January.....	83.891	4.88	4.63	73.41	17.08	0.66	17.95	11,518	12,109	\$3.45
February.....	118.165	5.04	4.21	73.48	17.27	.66	18.17	11,460	12,068	3.45
March.....	152.286	4.24	4.47	71.70	19.59	.56	20.48	11,237	11,735	3.31
April and June.	75.871	4.23	5.21	74.30	16.26	.46	17.00	11,754	12,268	3.49
Total.....	430.213									
Average..		4.58	4.56	72.99	17.87	.59	18.73	11,444	11,993	3.45

**WASHINGTON, D. C., TREASURY DEPARTMENT, TREASURY BUILDING.**

[Girard Mammoth No. 2 buckwheat anthracite; 1,200 tons, at \$2.99; 18 per cent ash.]

1909.										
July and August.....	206.348	5.95	6.19	71.88	15.98	0.58	16.99	11,303	12,018	\$2.99
November.....	125.379	5.62	6.71	74.87	12.80	.52	13.54	11,694	12,390	3.11
December.....	258.665	6.22	5.32	72.10	16.36	.51	17.44	11,349	12,102	2.99
1910.										
January.....	339.335	6.62	5.27	67.63	20.48	.57	21.92	10,731	11,492	2.51
February.....	31.594	5.70	4.50	68.10	21.70	.95	23.00	10,610	11,250	2.51
Total.....	961.321									
Average..		6.21	5.64	70.70	17.45	.56	18.60	11,141	11,879	2.99

**WASHINGTON, D. C., TREASURY DEPARTMENT, TREASURY BUILDING.**

[Star run of mine, Miller bed, Star mine, Cambria County, Pa.; 800 tons, at \$3.14; 5 per cent ash, 14,250 B. t. u.]

1909.										
July.....	35.563	2.04	19.84	71.69	6.43	1.69	6.56	14,431	14,732	\$3.1799
September.....	25.810	2.83	16.13	71.44	9.60	1.94	9.85	13,693	14,085	2.9473
October.....	11.205	1.30	20.00	72.80	5.90	1.60	6.00	14,630	14,820	3.2237
November.....	176.750	1.77	19.96	71.89	6.38	1.82	6.49	14,472	14,733	3.1889
December.....	134.045	2.21	20.48	70.42	6.89	1.98	7.06	14,269	14,591	3.1242
1910.										
January.....	28.482	5.30	19.50	68.50	6.70	1.70	7.10	13,760	14,530	3.0120
February.....	174.147	2.51	19.79	70.81	6.89	1.76	7.12	14,302	14,670	3.1315
March.....	201.612	1.98	19.36	71.35	7.31	2.08	7.46	14,261	14,549	3.1224
April.....	97.567	2.63	16.96	72.66	7.75	1.20	7.97	14,100	14,480	3.0899
May.....	63.991	2.40	16.80	71.73	9.07	.97	9.33	13,858	14,199	2.9836
June.....	45.955	2.30	16.25	73.45	8.00	1.03	8.20	14,050	14,381	3.0559
July.....	66.281	1.87	16.50	72.94	8.69	1.15	8.86	13,995	14,262	3.0438
Total.....	1,061.408									
Average..		2.26	18.93	71.52	7.29	1.69	7.47	14,222	14,551	3.1138

**WASHINGTON, D. C., TREASURY DEPARTMENT, WINDER BUILDING.**

[Star run of mine, Miller bed, Star mine, Cambria County, Pa.; 400 tons, at \$3.14; 5 per cent ash, 14,250 B. t. u.]

1909.										
July.....	31.665	2.07	19.91	72.70	5.32	1.64	5.43	14,595	14,904	\$3.2160
September.....	27.625	2.00	21.00	70.10	6.90	2.20	7.00	14,380	14,680	3.1686
October.....	14.545	2.00	19.50	72.20	6.30	1.70	6.40	14,260	14,550	3.1422
November.....	22.509	1.90	20.50	71.10	6.50	2.15	6.60	14,440	14,720	3.1819
December.....	27.491	3.40	19.50	70.40	6.70	1.70	7.00	14,160	14,660	3.1202
	22.335	2.00	20.00	71.10	6.90	1.85	7.00	14,340	14,630	3.1598
1910.										
January.....	74.558	3.59	19.46	70.42	6.53	1.29	6.78	14,133	14,659	3.1142
February.....	50.000	2.76	19.81	71.00	6.43	1.70	6.64	14,299	14,705	3.1508
March.....	25.415	2.20	16.50	72.90	8.40	.85	8.50	13,990	14,300	3.0427
April.....	34.000	2.57	16.31	73.03	8.09	.92	8.35	14,022	14,392	3.0498
May.....	17.125	2.00	17.00	71.30	9.70	1.75	9.90	13,820	14,110	2.9752
June.....	15.094	1.86	16.20	73.54	8.40	1.04	8.52	14,018	14,282	3.0489
Total.....	362.366									
Average..		2.60	19.02	71.42	6.96	1.53	7.14	14,215	14,595	3.1123

RESULTS OF ANALYSES.

TABLE 9.—Analyses of coals delivered to the Government under contracts, 1909–10—Con.

WASHINGTON, D. C., WAR DEPARTMENT, ARMY MEDICAL MUSEUM.

[Girard Mammoth broken anthracite, Buck Mountain bed, Schuylkill County, Pa.; 325 tons, at \$5.50; 10 per cent ash.]

Date.	Tons delivered.	Proximate analysis, "as received."					B. t. u.			Corrected price per ton.
		Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.	Ash "dry coal."	"As received."	"Dry coal."	
1909. August.....	100						10.66			\$5.50
1910. January.....	75						13.30			5.29
March.....	75						9.20			5.50
Total....	250									
Average..							11.01			5.50

WASHINGTON, D. C., WAR DEPARTMENT, 1725 F STREET.

[Lee Lyth or William Penn egg anthracite, Susquehanna mines, Luzerne and Schuylkill Counties, Pa.; 43 tons at \$6.09; 10 per cent ash.]

1909. August.....	15						11.20			\$6.09
December.....	10						12.10			5.94
1910. January.....	15						9.30			6.09
March.....	10						9.00			6.09
Total....	50									
Average..							10.37			6.09

WASHINGTON, D. C., WAR DEPARTMENT, FILTRATION PLANT.

[Elk Lick run of mine, Pittsburg bed, Elk Lick mines, West Salisbury, Pa.; 3,600 tons a at \$3.01; 7 per cent ash, 14,000 B. t. u.]

1909. August.....	47	2.00					9.71	13,977	14,262	\$2.9851
September.....	44	1.60					8.80	14,080	14,310	3.0272
Total....	91									
Average..		1.81					9.27	14,027	14,286	2.9958

WASHINGTON, D. C., WAR DEPARTMENT, FILTRATION PLANT.

[Run of mine, C' bed, Orenda mine, Boswell, Somerset County, Pa.; 3,600 tons a at \$3.15; 6 per cent ash; 14,300 B. t. u.]

1909. September.....	380.43	2.33					9.38	13,837	14,169	\$3.0080
October.....	98.88	2.24					8.73	13,930	14,250	3.0485
November.....	455.44	2.10					8.73	13,930	14,230	3.0485
December.....	523.19	2.42					9.95	13,691	14,031	2.9758
1910. January.....	632.48	3.67					10.54	13,429	13,941	2.8881
March.....	541.82	2.21					10.73	13,628	13,936	2.9320
April.....	411.10	1.94					9.81	13,764	14,036	2.9919
May.....	225.67	1.94					9.52	13,837	14,111	3.0080
June.....	542.83	2.33					9.63	13,786	14,110	2.9968
Total....	3,811.84									
Average..		2.45					9.84	13,718	14,063	2.9818

a Contract based on an estimate of 3,600 tons of either Elk Lick or Orenda, as may be preferred after trial.

TABLE 9.—Analyses of coals delivered to the Government under contracts, 1909–10—Con.

**WASHINGTON, D. C., WAR DEPARTMENT, FORD BUILDING.**

[Susquehanna stove anthracite; 350 tons at \$6.35; 12 per cent ash.]

Date.	Tons delivered.	Proximate analysis, "as received."					Ash "dry coal."	B. t. u.		Corrected price per ton.
		Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.		"As received."	"Dry coal."	
1909.										
July.....	100						12.26			\$6.35
1910.										
February.....	100						10.83			6.35
March.....	50						10.90			6.35
Total....	250									
Average..							11.42			6.35

**WASHINGTON, D. C., WAR DEPARTMENT, 1712 G STREET.**

[Lee Lyth or William Penn egg anthracite, Susquehanna mines, Luzerne and Schuylkill Counties, Pa.; 13 tons at \$6.09; 10 per cent ash.]

1909.										
July.....	3						10.73			\$6.09
December.....	3						10.30			6.09
1910.										
February.....	2						10.70			6.09
March.....	3						9.80			6.09
.....	2						13.40			5.88
Total....	13									
Average..							10.82			6.09

**WASHINGTON, D. C., WAR DEPARTMENT, 1712 G STREET.**

[Lee Lyth or William Penn stove anthracite, Susquehanna mines, Luzerne and Schuylkill Counties, Pa.; 8 tons, at \$6.44; 12 per cent ash.]

1909.										
July.....	3						14.40			\$6.29
December.....	2						12.10			6.44
1910.										
February.....	2						13.00			6.44
March.....	1						14.70			6.26
Total....	8									
Average..							13.51			6.44

**WASHINGTON, D. C., WAR DEPARTMENT, 1744 G STREET.**

[Lee Lyth or William Penn egg anthracite, Susquehanna mines, Luzerne and Schuylkill Counties, Pa.; 70 tons, at \$6.09; 10 per cent ash.]

1909.										
July.....	25						11.32			\$6.09
December.....	25						11.40			6.09
1910.										
February.....	25						9.80			6.09
Total....	75									
Average..							10.84			6.09

TABLE 9.—Analyses of coals delivered to the Government under contracts, 1909-10—Con.

**WASHINGTON, D. C., WAR DEPARTMENT, ISTHMIAN CANAL COMMISSION.**

[Broken anthracite; 125 tons, at \$5.54; 10 per cent ash.]

Date.	Tons delivered.	Proximate analysis, "as received."					Ash "dry coal."	B. t. u.		Corrected price per ton.
		Mois- ture.	Vola- tile matter.	Fixed carbon.	Ash.	Sul- phur.		"As re- ceived."	"Dry coal."	
1909. December.....	24.23						9.70			\$5.54
1910. January.....	27.03						15.30			5.30
February.....	20.85						15.20			5.30
March.....	25.33						10.60			5.54
June.....	23.39						10.60			5.54
Total....	120.83						12.28			5.39
Average..										

**WASHINGTON, D. C., WAR DEPARTMENT, LEMON BUILDING.**

[Mahanoy, Philadelphia &amp; Reading egg anthracite, Mammoth bed; 285 tons, at \$5.98; 10 per cent ash.]

1909. July.....	15						13.40			\$5.77
August.....	15						11.16			5.98
September.....	30						11.80			5.98
October.....	15						12.60			5.80
November.....	30						11.43			5.98
December.....	30						11.25			5.98
1910. January.....	15						10.20			5.98
	15						14.00			5.74
	15						11.20			5.98
February.....	30						11.45			5.98
March.....	30						10.90			5.98
May.....	15						11.40			5.98
June.....	10						11.55			5.98
Total....	265						11.63			5.98
Average..										

**WASHINGTON, D. C., WAR DEPARTMENT, UNITED STATES SOLDIERS' HOME.**

[Stove anthracite; 300 tons at \$6.35; 12 per cent ash.]

1902. August.....	30.72						13.49			\$6.35
October.....	63.39						15.60			6.11
December.....	70.14						11.40			6.35
1910. January.....	88.00						12.80			6.35
February.....	55.44						15.50			6.14
May.....	56.79						12.86			6.35
Total....	379.48						13.52			6.35
Average..										

**WASHINGTON, D. C., WAR DEPARTMENT, UNITED STATES SOLDIERS' HOME.**

[Elk Lick run of mine, Pittsburg bed, Elk Lick mine, West Salisbury, Pa.; 6,600 tons, at \$3.03; 7 per cent ash; 14,000 B. t. u.]

1909. October.....	47.54	1.70					9.70	13,840	14,070	\$2.9754
November.....	46.20	1.60					10.30	13,690	13,920	2.9229
Total....	93.74									
Average..		1.65					9.99	13,767	13,998	2.9596

TABLE 9.—Analyses of coals delivered to the Government under contracts, 1909–10—Con.

## WASHINGTON, D. C., WAR DEPARTMENT, UNITED STATES SOLDIERS' HOME.

[Orenda run of mine, C' bed, Boswell, Somerset County, Pa.; 6,600 tons <sup>a</sup> at \$3.17; 6 per cent ash, 14,300 B. t. u.]

Date.	Tons delivered.	Proximate analysis, "as received."					Ash "dry coal."	B. t. u.		Corrected price per ton.
		Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.		"As received."	"Dry coal."	
1909.										
July.....	301.475	1.67	.....	.....	.....	.....	8.92	13,988	14,227	\$3.0808
August.....	247.290	1.97	.....	.....	.....	.....	9.25	13,948	14,234	3.0520
September.....	362.870	1.97	.....	.....	.....	.....	9.10	13,952	14,232	3.0529
October.....	254.240	2.27	.....	.....	.....	.....	8.82	13,926	14,249	3.0671
November.....	617.610	2.13	.....	.....	.....	.....	8.85	13,915	14,218	3.0647
December.....	766.790	2.18	.....	.....	.....	.....	10.67	13,627	13,931	2.9508
1910.										
January.....	389.240	2.49	.....	.....	.....	.....	10.90	13,559	13,905	2.9357
.....	528.980	3.15	.....	.....	.....	.....	10.32	13,579	14,021	2.9402
February.....	509.600	2.61	.....	.....	.....	.....	9.95	13,669	14,035	2.9901
March.....	523.600	2.06	.....	.....	.....	.....	9.74	13,809	14,099	3.0212
April.....	604.070	2.20	.....	.....	.....	.....	11.28	13,502	13,806	2.8731
May.....	516.510	2.02	.....	.....	.....	.....	10.04	13,758	14,042	2.9799
June.....	293.160	2.27	.....	.....	.....	.....	9.61	13,800	14,120	3.0192
Total.....	5,915.435	.....	.....	.....	.....	.....	.....	.....	.....	.....
Average..	.....	2.26	.....	.....	.....	.....	9.95	13,742	14,060	3.0063

## WATERTOWN, MASS., WATERTOWN ARSENAL.

[Philadelphia &amp; Reading, broken anthracite, Schuylkill district, Pa.; 400 tons at \$5.75; 10 per cent ash.]

1909.										
August.....	60	3.08	.....	.....	.....	.....	12.96	12,467	12,863	.....
September.....	<sup>b</sup> 85	3.34	.....	.....	.....	.....	12.42	12,602	13,037	.....
December.....	50	3.40	.....	.....	.....	.....	11.30	12,680	13,130	.....
1910.										
January.....	50	3.60	.....	.....	.....	.....	12.40	12,490	12,960	.....
March.....	70	4.00	.....	.....	.....	.....	12.10	12,600	13,120	.....
May.....	30	3.45	.....	.....	.....	.....	10.40	12,950	13,415	.....
June.....	100	3.30	.....	.....	.....	.....	10.20	12,905	13,340	.....
Total.....	<sup>b</sup> 445	.....	.....	.....	.....	.....	.....	.....	.....	.....
Average..	.....	3.44	.....	.....	.....	.....	11.68	12,671	13,122	.....

## WATERTOWN, MASS., WATERTOWN ARSENAL.

[New River run of mine, Sewell and Fire Creek beds, Fayette and Raleigh Counties, W. Va.; 5,000 tons at \$3.75; 5 per cent ash, 14,650 B. t. u.]

1909.										
July.....	<sup>c</sup> 840	2.13	.....	.....	.....	.....	6.16	14,399	14,712	\$3.6858
October.....	510	4.59	.....	.....	.....	.....	6.11	14,038	14,713	3.5933
November.....	425	2.54	.....	.....	.....	.....	6.14	14,290	14,662	3.6578
December.....	525	2.65	.....	.....	.....	.....	6.24	14,327	14,717	3.6673
1910.										
January.....	550	3.46	.....	.....	.....	.....	6.91	14,029	14,532	3.5910
March.....	540	2.91	.....	.....	.....	.....	7.01	14,200	14,626	3.6148
April.....	630	3.58	.....	.....	.....	.....	7.54	13,998	14,518	3.5631
June.....	460	3.24	.....	.....	.....	.....	6.82	14,106	14,578	3.6108
Total.....	<sup>c</sup> 4,480	.....	.....	.....	.....	.....	.....	.....	.....	.....
Average..	.....	3.09	.....	.....	.....	.....	6.62	14,183	14,635	3.6305

<sup>a</sup> Contract based on an estimate of 6,600 tons of either Orenda or Elk Lick, as may be preferred after trial.<sup>b</sup> This tonnage only approximate.<sup>c</sup> Tonnages only approximate.

TABLE 9.—Analyses of coals delivered to the Government under contracts, 1909-10—Con.

## WILMINGTON, N. C., ENGINEER OFFICE, UNITED STATES ARMY.

[Pocahontas and New River run of mine; 880 tons per month;<sup>a</sup> 6 per cent ash.]

Date.	Tons delivered.	Proximate analysis, "as received."					Asd "dry coal."	B. t. u.		Corrected price per ton.
		Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.		"As received."	"Dry coal."	
1909.										
July.....	145.00	2.95	18.15	75.32	3.58	0.62	3.69	14,790	15,240	.....
August.....	800.00	2.53	18.65	72.81	6.01	.78	6.19	14,448	14,823	.....
September.....	760.00	1.90	20.28	74.07	3.75	.68	3.81	14,784	15,070	.....
October.....	600.00	2.44	19.25	73.17	5.14	.88	5.24	14,552	14,916	.....
November.....	900.00	1.98	20.19	72.62	5.21	.85	5.30	14,609	14,904	.....
December.....	<sup>b</sup> 900.00	2.07	18.92	72.88	6.13	.71	6.25	14,484	14,790	.....
1910.										
January.....	947.55	1.89	22.33	71.09	4.69	.63	4.77	14,649	14,931	.....
February.....	857.90	2.46	18.09	73.40	6.05	.71	6.22	14,456	14,821	.....
March.....	1,063.85	1.72	21.28	71.73	5.27	.66	5.35	14,576	14,831	.....
April.....	911.90	2.14	19.37	72.60	5.89	.72	6.01	14,543	14,861	.....
May.....	699.40	1.78	18.39	73.51	6.32	.73	6.42	14,446	14,708	.....
June.....	713.15	1.85	23.14	70.51	4.50	.60	4.60	14,638	14,914	.....
Total.....	9,298.75									.....
Average..		2.07	20.01	72.58	5.34	.72	5.45	14,566	14,874	.....

<sup>a</sup> Contract made anew each month for 880 tons, the price per ton and B. t. u. standard, when such was employed, being as follows: July, August, September, and October, \$3.10; November, \$3.15; December, \$3.13, 14,600 B. t. u.; January, \$3.20, 14,800 B. t. u.; February, \$3.25; March, \$3.30, 14,400 B. t. u.; April, \$3.30, 14,450 B. t. u.; May and June, \$3.25, 14,500 B. t. u.

<sup>b</sup> Deliveries amounted to 18 cars estimated at 50 tons each.

<sup>c</sup> Tons of 2,000 pounds.

# THE FUEL-INSPECTION LABORATORY OF THE BUREAU OF MINES.

BY JOSEPH D. DAVIS.<sup>a</sup>

## INTRODUCTION.

From a commercial standpoint the object of subjecting a sample of any material to chemical analysis is usually twofold—to ascertain not only the quantity of valuable constituents, but also the quantity of undesirable constituents present. These proportions are determined, in the case of coal, by what is known as a proximate<sup>b</sup> analysis and by a heating-value determination. From figures thus obtained by analysis and heating-value determination the commercial evaluation of coal is effected.

This paper aims so to describe the equipment and method of procedure used in the fuel-inspection laboratory of the Bureau of Mines in making a coal analysis that the layman may readily grasp the salient features. No attempt is made to present a strictly scientific discussion of the subject.

It is important to understand thoroughly just why a given assay or test is made and just what its results show quantitatively as to the quality of the tested material. The chemist, knowing for what the material is to be used and what is required of it, devises an analytical scheme that best fits the individual case. In other words, he determines only those constituents or qualities that have a direct effect on the proposed use of the material. Thus it rarely ever happens that a complete analysis is necessary. For example, one would not think of assaying a steam coal for phosphorus, because, under a boiler, the small quantity of phosphorus contained in coal has no well-defined effect, deleterious or otherwise. However, if it is proposed to make foundry coke from the coal, the phosphorus content is all important. Coke high in phosphorus is totally unfit for use in making most grades of iron.

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<sup>a</sup> Assistant chemist, in charge of the laboratory during the fiscal years 1910-11 and 1911-12.

<sup>b</sup> The conventional term "proximate" applied to an analysis is not intended to convey the meaning that the analysis is only approximately correct, but is used to distinguish this form of analysis from an ultimate analysis. The term "ultimate" is applied to an analysis in which elements or radicals representing strictly the chemical nature of the substance are determined; "proximate" is used when a number of chemical constituents are determined together, the result being an expression of the quantity of some commonly or technically known part of the substance; for instance, for coal, ash, or moisture. For the same sample, the moisture and ash figures of a proximate analysis may be duplicated just as closely as those for the total carbon of an ultimate analysis.



As a material becomes better known technically; that is, after it has for some time been bought and sold on a specification basis and after dealers have come to think of it on that basis, the task of the engineer and of the chemist becomes easier. Often a single assay will give all the information required. The use then to which a material is to be put and a knowledge of how all grades of the material behave must determine the form that the analysis will take. The foregoing statement applies also to the sample. One should keep in mind the relative importance of the various constituents in sampling just as surely as in making the analysis.

#### IMPORTANCE OF REPRESENTATIVE SAMPLES.

Few persons realize fully the importance of care in taking samples for analysis, and even technical men have a tendency to overlook it. For instance, the general tendency is to think that one may go to a pile of a given material, pick out any likely looking portion, send it to a chemist, and obtain from him an analysis and interpretation that will be representative of all the material. A little thought should convince any one that results so obtained give information only as regards the small quantity taken at random, and give no information as to the quality of the material in bulk. The above procedure would be allowable if it were certain that there could be no variation in the material, or, in other words, that the material sampled was such a homogeneous mixture that the analysis of all the portions selected at random would agree. This is probably never the case.

What must be obtained is a portion (of convenient weight and proper fineness) containing in the same proportions all of the constituents of the original quantity under consideration. For example, if a lot of 100 tons of coal contains 10 tons of ash, a 3-ounce laboratory sample representing that 100 tons must contain the same proportion, or 0.3 ounce of ash. The laboratory sample must be an average of all the constituents of the original quantity; otherwise, laboratory results are worse than worthless in that they are misleading.

The following details in sampling coal are of major importance: (1) Due allowance must be made for the quality of coal the sample is taken to represent. (2) The original sample (amount and fineness depending on the variations in the coal) must be reduced to not more than 3 ounces before it can be conveniently handled in the laboratory. (3) The final 3-ounce sample must be homogeneous and so thoroughly mixed that every unit weight (1 gram, or about  $\frac{1}{30}$  oz.) of it taken for a determination still truly represents the original quantity of coal under consideration. (4) Care must be taken to avoid the loss of light, volatile constituents during sampling.

After the requirements given above have been observed and after every known precaution has been exercised, the question will arise

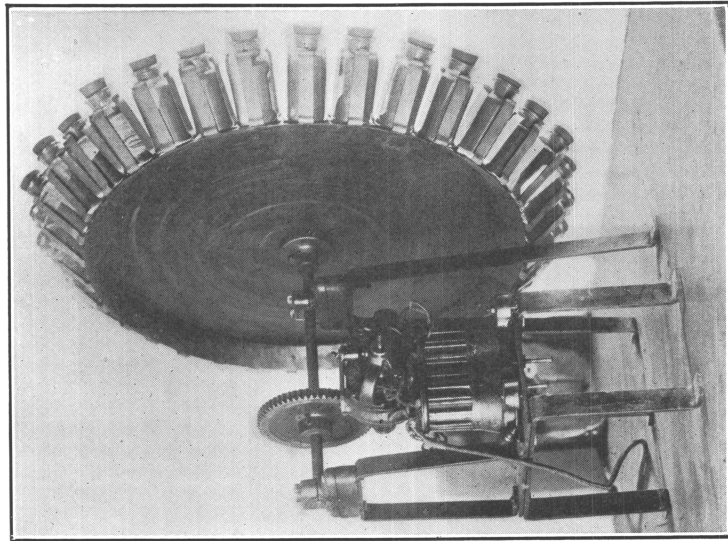
as to how the chemist is going to prove that his 3-ounce sample is representative. There is a mathematical method involving, for a major constituent, the determination of the relation of size to weight, thus establishing limits for the quantity of the sample and for the fineness of the screen through which it should pass. Obviously, the best method is to take several samples of the original quantity and subject them separately to analysis. The agreement of the several analyses will give indication as to the reliability of each. This process should, of course, be carried out for all different grades of coal sampled.

#### MIXING BEFORE ANALYSIS.

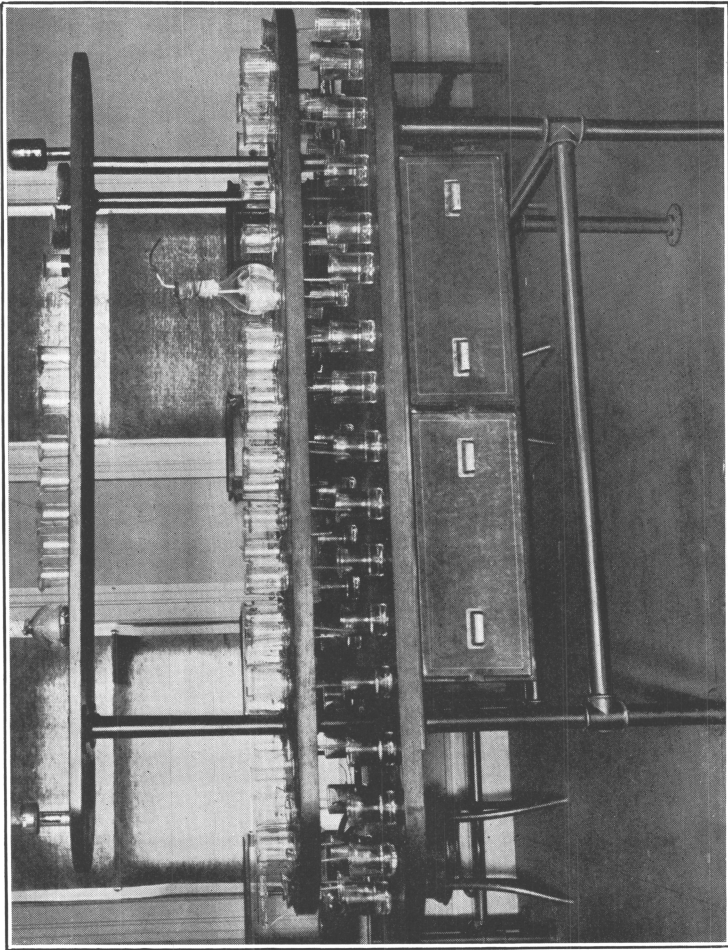
It has been found that if the 3-ounce sample of fine coal containing heavy foreign matter in the form of slate, pyrites, etc., is allowed to stand for a while before analysis, the heavy particles tend to settle to the bottom of the container. This tendency becomes more pronounced if the place of storage is subject to much vibration, such as that caused by the running of heavy machinery. To offset this tendency the sample should be thoroughly mixed previous to analysis. At the fuel-inspection laboratory of the Bureau of Mines all bottle samples are thoroughly mixed by the use of a specially designed machine (Pl. I, A) devised in the laboratory. The best method of mixing a dry material is to roll it. The bureau's machine is built to utilize this method. The sample bottles, set at an angle of  $45^\circ$  with the axis, are placed on the periphery of a rigid wheel stamped from sheet steel. When the wheel rotates each sample is subjected to a rolling motion in all directions. The wheel must not be allowed to rotate so rapidly that centrifugal force has an appreciable action on the mixing. The proper speed may be easily determined by experiment—that is, by running the wheel at different speeds and at each speed observing the motion of the particles inside the bottles. From 30 to 40 revolutions per minute is found to give the best results with the bureau's machine.

#### ARRANGEMENT AND CHARACTER OF EQUIPMENT.

The fuel-inspection laboratory of the Bureau of Mines occupies four rooms on the fourth floor of the Bureau of Mines building and a room, for sample preparation, in the basement. Of these rooms the largest (17 by 34 feet) is equipped for general laboratory work. a room 20 by 16 feet is devoted to calorimeter work, and a small fire-proof room (8 by 10 feet) is fitted for furnace work. A room 10 by 16 feet serves for desk space.



4. MIXING WHEEL.



B. FILTER TABLE.



## THE SAMPLING ROOM.

Each sample (weighing from 2 to 4 pounds) received for analysis is given a serial number for identification, and is then sent to the sampling room, where it is prepared for the laboratory.

If any "2-pound" sample does not pass through a screen of  $\frac{1}{4}$ -inch mesh (some samples taken outside of Washington do not) it is reduced to the proper fineness by means of an adjustable chipmunk jaw crusher. The "2-pound" sample is next reduced to 20-mesh fineness (coals that contain much foreign matter are crushed finer) in a roll crusher, and a 3-ounce portion is immediately placed in a rubber-stoppered bottle for a "total-moisture" determination (see p. 80). The 20-mesh coal is thoroughly mixed, and is then successively passed through riffles and reduced to a quantity of not more than 3 ounces.

If two or more "2-pound" samples are mixed for one laboratory sample, they are crushed to 20-mesh fineness and placed in a mixing and reducing machine, and the mixture is reduced to about 4 ounces, a 3-ounce portion being taken from the first discharge for a "total-moisture" determination. The use of the machine for mixing these samples, as for mixing the larger samples, insures a thorough mixture, and minimizes moisture losses while the coal is being mixed and reduced in quantity. The 3-ounce portion is ground by means of a planetary disk crusher until by trial all its particles pass through a 60-mesh screen. It is then placed in a rubber-stoppered bottle and sent to the laboratory for analysis. During the process of reduction the sample unavoidably becomes partly air dried. Accuracy in calculating its condition "as received" is insured by using for this condition the moisture value determined on the "total-moisture" sample mentioned above.

For most anthracite samples and for any samples that are very wet or contain much foreign matter the preparation for the laboratory is varied, as follows:

The whole sample is put in a 10-inch cake pan, weighed, and placed in a large oven through which air at a temperature of about 32° C. (about 90° F.) is caused to circulate. It is allowed to remain in the oven until it is air dried—that is, until it no longer loses moisture, as determined by successive weighings. The coal is now said to be air dried and the figures for moisture thus determined are combined with the figures for moisture subsequently determined in the laboratory sample, from which the total moisture in the sample "as received" is calculated. The air-dried sample is then put through the rolls, reduced to 20-mesh fineness and thoroughly mixed. It is then reduced in quantity by means of riffles, or the

mixing and reducing machine, until about 8 ounces remain. This 8-ounce sample is ground still finer in a porcelain ball mill.

This mill consists of a number of cylindrical porcelain jars firmly fixed in a revolving framework of steel. The jars are 8.95 inches in diameter and 9.65 inches high. They are removable and are provided with porcelain covers fitted with rubber gaskets and screw clamps so that they may be made air tight. For grinding the coal the jars are filled about two-thirds full of smooth flint pebbles. After having been nearly filled with pebbles and coal the jars are revolved at about 60 revolutions per minute, and the pebbles knocking against each other quickly reduce the 8-ounce sample to a powder.

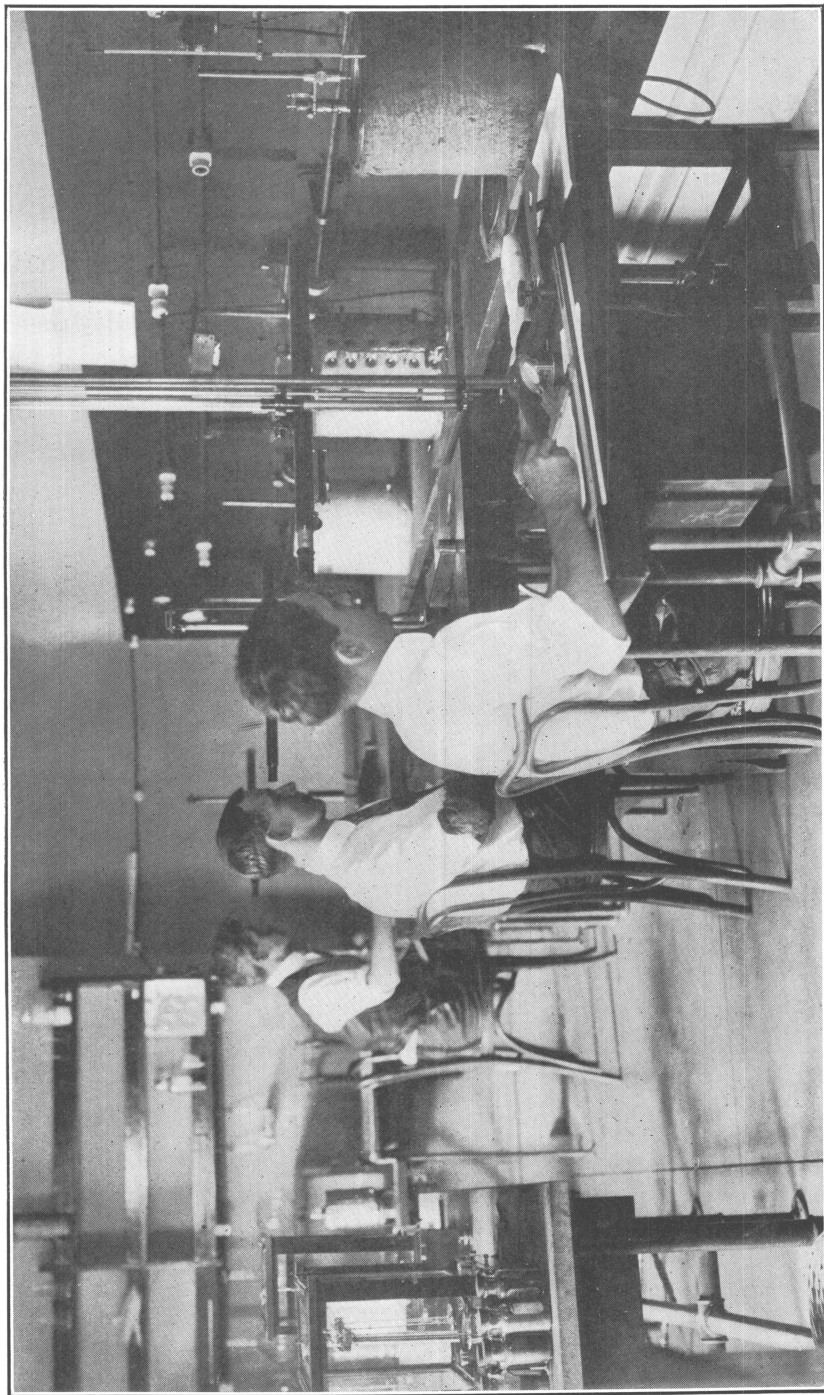
The powdered sample is then passed through riffles, reduced in quantity to about 3 ounces, placed in a rubber-stoppered bottle, and sent to the laboratory.

During the preparation of a sample in the sampling room, the discarded portions from the riffles are put back in the original can and kept for a time in case another analysis, to check the first results, should seem desirable.

#### OTHER ROOMS.

The room for general work is furnished with three worktables of steel with stone tops, each piped for gas, water, blast, and vacuum. A hood 20 feet long, 4 feet deep, and divided into five compartments of equal width by wire-glass partitions occupies the wall space on one side of the room. This hood is built entirely of stone supported on heavy iron piping and is piped for water, gas, and blast. The balance table consists of a stone slab, 16 by 2 feet, supported by heavy iron pipes. The filter table is shown in Plate I, *B*. This table is designed to facilitate the handling of a large number of filtrations at the same time. The tops are of wood, the supports of iron piping, and the drawers (arranged so they can be pulled out from either side) are made of sheet steel. Stone and steel have been used wherever possible in the construction of the laboratory fixtures, thus minimizing the danger from fire.

The muffle room is also fireproof. The walls are of hollow tile, and the muffle table, supporting two Cary gas muffle furnaces, is made of a single heavy slab of stone on a frame of angle irons supported by 1-inch iron piping. The door and door casings are of iron and steel. A small  $\frac{1}{2}$ -horsepower multivane blower serves to change the air in the room completely once in every two minutes, and keeps the room temperature from getting unbearably high. The blast for the furnaces is furnished by a rotary pump driven by a 1-horsepower motor and is piped from a penthouse located on the roof of the building.



CALORIMETER ROOM





The arrangement of the calorimeter room (Pl. II) makes possible the expeditious handling of a large volume of routine work. From four to six men work continuously on calorimetry. Each man is supplied with a complete calorimetric outfit and does not in any way interfere with the work of his associates. The calorimeters are arranged in a row on an 18-foot table at the back of the room so that the light from the windows in front falls upon the thermometers in such a way as to facilitate the reading of them. An observation table and a reading telescope are provided for each man.

Plate III, *A*, shows the constant-temperature apparatus. This consists of two tanks, *a* and *b*, a stirrer driven by a motor and immersed in tank *a*, and an electric thermostat operating a magnetic valve in tank *b*. The water in *a* is kept at a constant temperature, about 2° C. below that of the room, to obviate the adjustment of temperature for each determination. The refuse warm water from the calorimeters is constantly thrown into tank *a*, and to compensate for this heat input the thermostat automatically operates the valve in tank *b* and lets into tank *a* a quantity of ice water sufficient to bring the water there to the proper temperature again. Water for a calorimeter determination is measured by means of the carefully calibrated flask *c* and allowed to drain into the calorimeter can *d* as shown.

Each operator at the charging bench has an individual equipment consisting of an oxygen gage and connection, automatic burette and tube connection for washing out the bombs, and a bomb wrench.

A balance table of the same construction as that in the general laboratory occupies the center of the room.

#### APPARATUS AND METHODS USED IN ANALYTICAL DETERMINATIONS.

The analytical methods described here are adapted to suit the purpose of commercial evaluation, in which a large quantity of routine work must be handled rapidly and accurately. The methods used by the bureau in more strictly scientific work are described in Technical Paper 8, Bureau of Mines.<sup>a</sup>

The commercial evaluation of coal is based on the results of a proximate<sup>b</sup> analysis, a sulphur determination, and a heating-value determination. The proximate analysis consists of the determination of moisture, ash, volatile combustible matter, and fixed carbon, the latter being determined by difference. The methods for making a proximate analysis, as described in the following sections, will be found to be in close agreement with those recommended by the committee on coal analysis of the American Chemical Society.

<sup>a</sup> Stanton, F. M., and Fieldner, A. C. Methods of analyzing coal and coke. 1912. 21 pp. See also U. S. Geol. Survey Prof. Paper 48: Work of the chemical laboratory, by N. W. Lord. 1906. Pp. 175-195.

<sup>b</sup> See page 74.

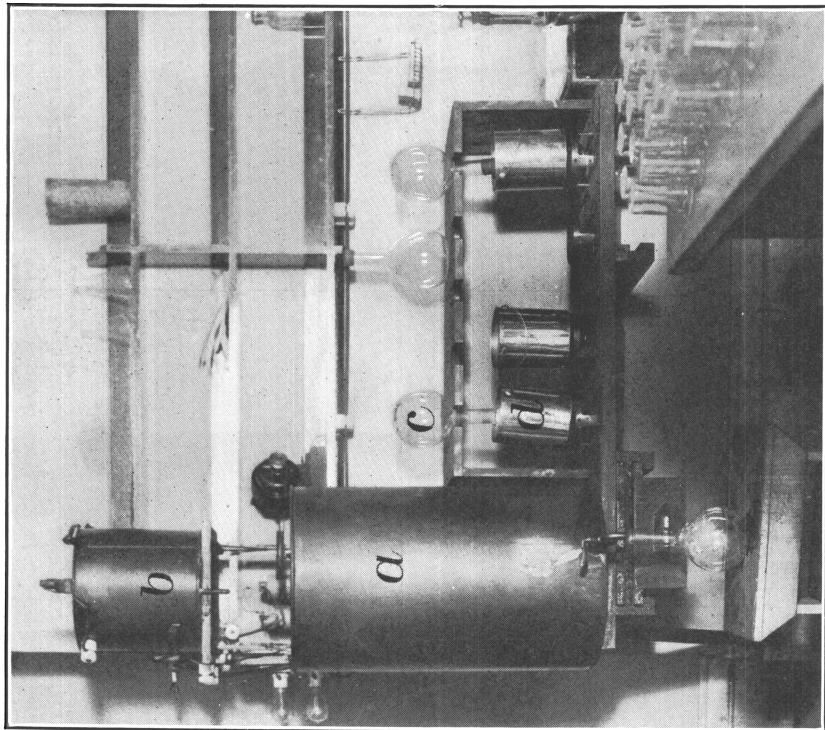
## DETERMINATION OF MOISTURE.

The determination of moisture in coal, though seemingly very simple, presents many difficulties. It is impossible, for instance, to reduce the sample to a convenient weight and size without losing some of the moisture in the process of reduction. How much is lost depends on the proportion of moisture originally carried by the coal. For this reason a "total-moisture" sample is taken immediately after the coal has been reduced to pass a 20-mesh sieve (p. 77). The moisture in this sample is determined separately and is called total moisture. Further, one must exercise care in regulating the temperature if heat is used in the drying. The temperature must not be too low lest all the moisture be not driven out, and it must not be too high lest some volatile matter that is not moisture escape. For this discussion moisture is defined as that water which was contained in the coal before it was mined (including only that moisture which is driven off under the conditions above specified) and in addition some water taken up through exposure to the weather.

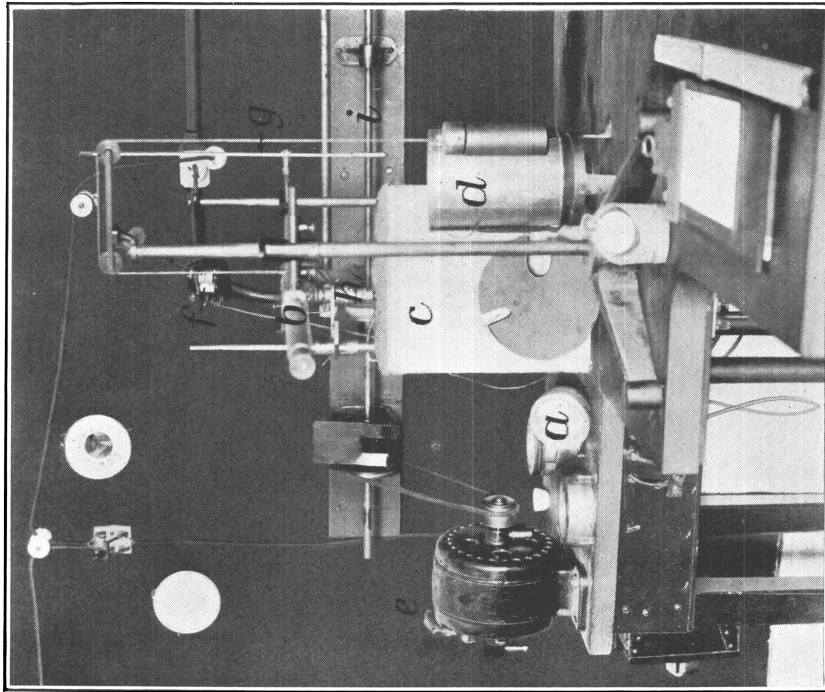
## APPARATUS.

For the determination of moisture there should be provided a good analytical balance, several Royal Meissen porcelain capsules, about No. 2 size, with thin aluminum lids, several ordinary glass desiccators, and a specially constructed drying oven.

The drying oven used in the fuel-inspection laboratory of the Bureau of Mines is rectangular (10 inches wide by 13 inches high) and is built entirely of heavy sheet copper. The drying space consists of four separate compartments into each of which fits a drawer or tray holding 12 sample crucibles. Each compartment is surrounded by a bath of boiling glycerin (2 parts glycerin to 1 part water) and has an opening at the back for admitting chemically dried air. The bath is heated by means of two Bunsen burners, and the entering air is heated to the temperature of the bath by passing through a coiled tube in the base of the oven. A return condenser is inserted into an opening at the top of the bath to prevent concentration by distillation. The chief advantages of this type of drying oven are that it has large capacity, can be uniformly heated, requires little attention and that any of the compartments may be opened without disturbing the temperature in the others. The trays are small (6 by 7½ inches) and as completely surrounded by the bath as may be, thus preventing temperature variations within the drying spaces. The glycerin solution boils at 248° F. and keeps the temperature within the drying spaces constant at about 221° F. By means of



A. CONSTANT-TEMPERATURE APPARATUS.



B. CALORIMETER DISMOUNTED TO SHOW PARTS.



this oven complete drying of a coal sample may be accomplished in one and one-half hours.

## METHOD.

One gram (about  $\frac{1}{30}$  ounce) of coal is taken from a bottle sample which has been thoroughly mixed on the mixing wheel. This is weighed into a porcelain capsule, the weight of which has been ascertained, and the capsule is placed in the oven and allowed to remain there for an hour and a half. It is then removed, covered with an aluminum lid, and placed in a desiccator to cool. When cool it is again weighed; the loss in weight represents moisture. The function of the desiccator is to keep the sample in a dry atmosphere and to prevent it from taking up moisture while cooling.

On account of the tendency of coal to lose moisture while being pulverized and exposed to the dry air of the laboratory, a moisture determination must be made on a comparatively coarse sample. This sample, called a "total-moisture" sample <sup>a</sup> is taken as quickly as possible after the coal has been reduced to 20-mesh fineness. The figures resulting represent total moisture, that is, all the moisture held by the coal. The following example shows how a sample of coal may lose moisture while being handled. It will be noted that the sample lost 1.21 per cent of its moisture while being ground to 60-mesh fineness.

*Laboratory sample.*

	Grams.
Weight of crucible, lid, and 1 gram of coal.....	19.3542
Weight of crucible, lid, and 1 gram of coal after being dried.....	19.3222
Loss.....	.0320

$$\frac{.0320}{1} = 3.20 \text{ per cent.}$$

*Total-moisture sample.*

Weight of crucible, lid, and 5 grams coal.....	20.5463
Weight of crucible, lid, and 5 grams of coal after being dried.....	20.3260
Loss.....	.2203

$$\frac{.2203}{5} = 4.41 \text{ per cent.}$$

## DETERMINATION OF ASH.

Ash, as determined by the proximate analysis, is much the same chemically as the refuse found in the ash pit of a furnace. However there is this important difference: In making an ash determination in the laboratory all the combustible contained in the coal is burned, and the manner of the combustion does not permit clinkering, whereas

<sup>a</sup> See p. 77.

ash from combustion in an ordinary furnace is usually found to contain from 10 to 50 per cent of unburned combustible and sometimes considerable clinker. This clinker incloses some carbonaceous matter which thus escapes combustion. However, most of the combustible in the ash-pit refuse is from the unconsumed coal that drops through the grate bars, especially when the fire is cleaned.

#### APPARATUS.

In the Bureau of Mines laboratory an ordinary assayer's furnace is used for burning out the combustible. The assayer's furnace consists of a fire-clay box or receptacle called a muffle inclosed in an iron-bound fire box built of firebrick and so supported in an interior-combustion chamber that the furnace gases do not enter it and that access may be had to it through an open end at the front. The muffle is heated to cherry redness by means of a gas blast from a special burner projecting into the combustion chamber.

#### METHOD.

The capsule containing the residue from the moisture determination is placed in the muffle and heated for one and one-half hours at about 1,652° F., with a slow draft of air circulating over it. This treatment burns out all the combustible and drives off some volatile matter that is not combustible. Here it may be explained that all the constituents given off by the coal in "ashing" are not heat producing. Aside from a certain amount of water of composition,<sup>a</sup> there are always present volatile constituents of inorganic matter which do not burn and are volatile at the ashing temperature; consequently the value of ash found by this method is slightly lower than it should be. This difference from the true ash value varies with the coal tested. The capsule containing the ash is allowed to cool and is weighed. Then it is placed back in the furnace, and the process is repeated to make sure that the combustible has been burned. An example of an ash determination follows:

	Grams.
Weight of capsule plus residue after heating 1½ hours.....	18.4652
Weight of capsule plus residue after second heating.....	18.4650
Weight of capsule.....	18.3542
Weight of ash.....	.1108

$$\frac{.1108}{1} = 11.08 \text{ per cent.}$$

<sup>a</sup> Water of composition does not necessarily exist in the compound as water but may be formed when the compound is decomposed, as when sufficiently heated.

## DETERMINATION OF VOLATILE COMBUSTIBLE MATTER.

There is considerable uncertainty among technical men as to just what the so-called combustible matter of coal is and as to what are the best methods of determining it. Volatile combustible is that part of coal (consisting of a number of compounds not well known chemically) which is distilled or driven off in the manufacture of coke.<sup>a</sup> The difficulty in determining these distillation products is that they vary in quantity and character according to the heating method employed, and the problem is to adopt a method that will give uniform results. A knowledge of the volatile combustible content of a coal enables one, within the limits of accuracy of the determination, to classify the coal.

## APPARATUS.

At the fuel-inspection laboratory the apparatus for the determination of volatile matter includes platinum crucibles (30 c. c. capacity), platinum supports for them, ring stands, and flame shields. The crucibles are the most expensive part of the equipment. To insure the best results they are always kept clean and in good condition and are provided with tightly fitting lids. A flame shield is made by bending a rectangular piece of sheet iron (about 6 by 10 inches) longitudinally in the form of a tube, punching holes in it to admit the platinum triangles or crucible supports, fitting the whole to a ring support, and clamping it to a stand.

## METHOD.

One gram of the coal is weighed into a weighed 30-c. c. platinum crucible, and the crucible is covered and placed on the crucible supports. A burner is placed underneath the crucible and so adjusted that it gives a carbon-free flame about 20 cm. in length; the bottom of the crucible is 7 cm. from the top of the burner. The Fletcher burner is used because it is best adapted for burning the gas supplied to the laboratory. The crucible is heated in the flame for exactly 7 minutes, taken off, allowed to cool and then weighed. The loss in weight represents volatile combustible matter. A specimen determination is shown below:

	Grams.
Weight of crucible plus 1 gram coal.....	30.2463
Weight of crucible plus 1 gram coal after being heated.....	30.0825
Loss.....	.1638
	Per cent.
Volatile combustible plus moisture.....	16.38
Moisture in sample.....	3.20
True volatile combustible.....	13.18

<sup>a</sup> Fieldner, A. C., and Davis, J. D., Some variations in the official method for the determination of volatile matter in coal, Jour. Ind. and Eng. Chem., vol. 2, July, 1910, p. 304.

## DETERMINATION OF SULPHUR.

Sulphur, like ash, is one of the constituents of coal that depreciate its value. For instance, a coal containing much sulphur is unfit for making coke and, in general, for use in all metal-working processes. Sulphur combines with the metal, forming compounds that make the metal brittle. It exists in coal as iron pyrite, combined with the organic matter, and as sulphates of the metals of the ash. When the sulphur content of a coal is high (say 3 per cent), iron pyrite is usually present.

## APPARATUS.

A detailed description of the methods used in the bureau's laboratory for the determination of sulphur in coal is thought advisable in view of the fact that methods found in chemical literature have been slightly modified to suit special needs. A list of the necessary apparatus, chemicals, and materials follows: 11-cm., No. 595, S. & S. filter papers for rapid filtration; 7-cm., No. 589, blue-ribbon S. & S. papers for retaining the sulphate precipitate; No. 00 Royal Meissen porcelain crucibles; an ordinary hot plate; special filter table, shown in Plate I, *B*, designed to facilitate the handling of a large number of determinations at one time; a 10 per cent solution of barium chloride; a 5 per cent solution of silver nitrate; a dilute solution of sulphuric acid; asbestos trays for holding crucibles in sets; 250-c. c. Jena glass beakers.

## METHOD.

*Treatment of the washings from a bomb calorimeter.*—After the combustion the calorimeter is washed out thoroughly and the washings collected in a 250-c.c. beaker. The washings are titrated with standard ammonia to obtain the "acid correction" for the heating value; 4 c. c. of strong ammonia is added, to insure complete precipitation of any metals in solution, and the solution is heated to boiling on the hot plate. The residue, mostly ash from the combustion, is filtered off and washed five times with hot water, and 5 c. c. of concentrated hydrochloric acid and a few drops of bromine water are added to the solution, which is placed back on the hot plate and heated to boiling; 10 c. c. of the hot barium chloride (10%) solution is added, and the precipitate is allowed to settle for at least two hours. The beaker containing the solution is then taken to the filter table, where the supernatant liquid is siphoned off and tested with dilute sulphuric acid for excess barium chloride, and the precipitated barium sulphate is collected on a 7-cm. filter paper. The precipitate is washed with hot water till the washings show no reaction for chlorides; it is then placed in the crucible, dried, ignited, and weighed. The ignition is effected by means of the muffle furnace (by using a



small filter paper appreciable loss in weight by reduction is avoided) and is completed in about 10 minutes. The crucible is then covered and allowed to cool. After cooling, the precipitate is brushed out on a balanced watch glass and weighed.

A specimen determination follows:

Weight of BaSO <sub>4</sub> .....	Grams. 0.1136
$.1136 \times .137 = .0156$ , weight of sulphur.	
$\frac{.0156}{1} = 1.56$ per cent.	

*Eschka's method.*<sup>a</sup>—Eschka's method for determining sulphur is used to check or verify results, and is as follows:

One gram of finely pulverized coal is weighed into a 30-c. c. platinum crucible into which about 1.5 grams of "Eschka's mixture" has been weighed. The coal and the mixture are then intimately mixed with a glass rod, covered completely with about 0.5 gram of the mixture, and heated over a small alcohol<sup>b</sup> flame till the coal is all burned. The heating is done slowly at first (not rapidly enough to blacken the mixture covering the charge) to avoid loss of volatile matter. The flame is then turned up and the combustion finished. The coal should be completely burned in two hours. The crucible is then allowed to cool. After cooling, its contents are brushed out into a beaker containing about 75 c. c. of boiling water, and the solution is stirred thoroughly. The residue is digested on the hot plate for about an hour and a half, washed two or three times by decantation (the washings being poured through a filter), and transferred to a filter. It is then washed thoroughly on the filter, 3 c. c. of concentrated hydrochloric acid and 5 c. c. of bromine water are added to the solution, and the process is continued as described in the first-mentioned method.

#### DETERMINATION OF HEATING VALUE.

The figures for heating value or calorific power give perhaps the most valuable information as to the quality of a given coal. By heating value is meant the heat that the coal yields on being burned completely. There is no simple unit by which heat quantity may be measured, so that the use of a derived unit is necessary. Such a unit is derived by measuring the effect of the absorption of a given amount of heat by some substance of uniform heat capacity. The substance selected is water, because water has a large and constant heat capacity and uniform heat distribution in water is easily effected. The heat unit commonly used in engineering is the so-called British thermal unit (B. t. u.) and may be defined as the amount of heat

<sup>a</sup> Lord, N. W., Notes on metallurgical analysis, 1903, p. 161.

<sup>b</sup> The burning off may be conducted over a gas flame if the sulphur content of the gas is low and a blank is run with every set of determinations.

required to raise 1° F. the temperature of 1 pound of water at or near 39.1° F. There is also the French or metric unit (calorie), which is commonly used in scientific investigations. The gram calorie, or small calorie (cal.), is the amount of heat required to raise the temperature of 1 gram of water 1° C., and the kilogram calorie, or large calorie (Cal.), is the amount of heat required to raise the temperature of 1 kilogram of water 1° C. Another thermal unit sometimes used is the pound calorie, the amount of heat required to raise the temperature of 1 pound of water 1° C.

For example, assume that under a vessel containing 2,000 pounds of water 20 pounds of coal is burned in such a manner that all of the combustible in the coal is consumed and all of the heat given off is used in heating the water. Assume that the temperature of the water before firing the coal was 40° F. and after the coal was all burned it was 186° F., or that there was a temperature rise of 146° F. caused by the combustion. The heating value (per pound) of the coal is derived as follows:

$$2,000 \times 146 = 292,000 \text{ B. t. u. for every 20 pounds of the coal, or,}$$

$$\frac{292,000}{20} = 14,600 \text{ B. t. u. per pound of coal.}$$

If conversion of the above figure into calories per gram of combustible is desired, the calculation is as follows, using the following relations: 1° C. equals  $\frac{9}{5}$ ° F., and 1 pound equals 453.6 grams:

$$14,600 \times \frac{5}{9} \times 453.6 = 3,679,200 \text{ calories per pound.}$$

$$\frac{3,679,200}{453.6} = 8,111.1 \text{ calories per gram.}$$

#### APPARATUS.

Of course, an ordinary boiler would not give the results outlined above, for several reasons. Some of the heat given off would be used in heating the walls of the furnace, the steel of the boiler, the air used, etc. Moreover, the combustion would not be complete. For exact heating-value determinations the Bureau of Mines uses a bomb calorimeter. This is an instrument in which a small quantity of combustible is completely burned and the resultant heat is transmitted to a weighed quantity of water in such a manner that the effect of the heat can be accurately measured by means of a thermometer. The chief requirements of a combustion-calorimeter outfit are: (a) That it shall effect complete combustion; (b) that it shall allow no heat to escape absorption by the water; (c) that its radiation and absorption factor shall be as small as possible, thus making correction easy; (d) that the thermometer used for measuring temperature differences shall be of the best quality and carefully calibrated.

The standard calorimetric outfit consists of a steel cup or bomb (lined with some acid-resisting material, such as porcelain or platinum) closed with a screw cap, and fitted with an oxygen valve, electrodes for electrical firing of the charge, a metal bucket for holding water and the bomb, a mechanical stirrer, and a thermometer. There is also an inclosing jacket to protect the instrument against room-temperature variations. The jacket consists of a double-walled brass can containing a relatively large quantity of water; it is covered with felt.

One of the calorimeters used in the bureau's fuel-inspection laboratory is shown in Plate III, *B*. The calorimeter has been taken down to show its parts. The platinum-lined steel bomb is shown open at *a*; *b* is a cathetometer, magnifying power of about 55 diameters, used for observing the thermometer, which is shown removed from the calorimeter at *g*. By means of this instrument the thermometer scale can be read accurately to  $0.001^{\circ}$  C. The calorimeter can *d*, containing exactly 1,850 grams of distilled water and the charged bomb, fits inside the double-walled felt-lagged jacket *c*; *h* is a ball-bearing stirrer of the propeller type driven at a constant speed of 1,800 revolutions per minute, by means of a friction pulley and rubber band from the shaft *i*; *f* is an electric thermometer tapper controlled by means of a push button at the operator's table; *e* is a  $\frac{1}{2}$ -horsepower electric motor that runs at a practically constant speed of 500 revolutions per minute. This motor, belted to the shaft as shown, serves to drive the stirrers of four calorimeters.

#### METHOD.

One gram of coal is weighed into a platinum tray and placed on a support inside of the bomb, a piece of platinum fuse wire is then connected to the electrodes and allowed to dip into the coal. The bomb cap is screwed into place (the cap is seated on a lead gasket so as to form a perfectly tight joint) and oxygen is forced in at a pressure of about 350 pounds per square inch. The bomb so charged is then placed in the can containing the weighed amount of water, the whole is put in place in the jacket, the thermometer and the stirrer are inserted, and the jacket is covered. The temperature of the calorimeter is observed at minute intervals for five consecutive minutes, and at the end of the fifth minute the electric circuit is closed, thus firing the coal. The thermometer is now observed carefully, as it registers the temperature increase of the water, and the temperature noted at given intervals is entered on the record sheet. The first two readings after firing are taken at half-minute intervals. Three more readings are taken at minute intervals. The maximum temperature will now have been reached and the thermometer is observed for five consecutive minutes to determine

the rate of gain or loss of heat. All the data for calculating the heating value of the coal have now been determined. The following corrections must, however, be made:

(a) The nitrogen content having been burned to nitric acid, the nitric-acid correction is obtained by titration of washings of the bomb with standard alkali of such a strength that 1 c. c. equals 5 calories or 9 B. t. u.

(b) The sulphur content, instead of having been burned to sulphurous acid, as in furnace combustion, has been burned in the bomb to sulphuric acid, and a correction must be made for this difference. The correction is made by using the figures for the percentage of sulphur found by analysis.

The net heating value is obtained by multiplying the rise of temperature caused by the combustion of the coal by the water value of the calorimeter (this includes the water equivalent of the apparatus plus the weight of the water used).

Calculations and corrections involved in this determination are given in detail in Technical Paper 8<sup>a</sup> of the Bureau of Mines.

#### CALIBRATION OF THE CALORIMETER.

In order that calorimetric results shall be reliable the water equivalent of the calorimeter must be accurately known. The water equivalent of the calorimeter is the heat capacity of the apparatus referred to water as unity; that is, the sum of the products of the parts multiplied by their several specific heats. The following are some of the methods used for arriving at these figures:

(1) By weighing the parts and adding the products of the weights multiplied by the specific heats.

(2) By burning in the calorimeter the same weight of a given substance, but using different amounts of water. Two equations may then be written involving two unknowns, namely, the water equivalent and the heating value of the substance.

(3) By introducing electrically into the calorimetric system a known amount of heat.

(4) By the well-known method of mixtures.

(5) By burning in the calorimeter a known weight of a substance, the heating value<sup>b</sup> of which is accurately known, and calculating the water equivalent by heat difference.

The last-mentioned method, by reason of its ready application, is the one most used by the bureau's fuel-inspection laboratory. A calorimeter may be frequently and easily checked by this method. The several calorimeters used by the bureau's fuel-inspection labo-

<sup>a</sup> Methods of analyzing coal and coke, by F. M. Stanton and A. C. Fieldner, 1912, pp. 12-16.

<sup>b</sup> For standard substances and standard heating values, see the standardization of bomb calorimeters, Bureau of Standards, Circular No. 11, 1911, 10 pp.

ratory are frequently checked with standard sucrose obtained from the Bureau of Standards and are further cross-checked with each other daily. Thus the probability of error is made very small.

#### PROCEDURE IN MAKING CALCULATIONS.

The results of the fuel-inspection work of each chemist are in the form of assays, which must be assembled and calculated to the proper basis before reporting. All these figures, as well as those on the assay sheets, are checked by the chemist who does the calculating and are rechecked by his assistant. As an example of a routine calculation, the following tabulation from assay sheets, together with the record cards, properly filled out, is shown.

#### *Routine calculation.*

Determination.	Amount.	Deter- mined by—	Checked by—
Volatile matter.....	21.00	K. J. O.	H. M. C.
Duplicate volatile.....	21.20	C.	H. M. C.
Moisture at 105° C.....	1.30	N.	H. M. C.
Ash.....	7.30	N.	H. M. C.
Total moisture.....	1.60	B.	H. M. C.
B. t. u.....	14,325	B.	K. J. O.
Duplicate B. t. u.....	14,310	W. F.	H. M. C.
Sulphur.....	.65	K. J. O.	H. M. C.

#### *Sample record card.*

#### LABORATORY RECORD.

Serial No. 37210.

Index No. 145.

Can No. 1864.

Air-dry.	Moist. 105°.	Total moist.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.	B. t. u.	B. t. u. (M.&A.F.)
	1.30	1.60	21.20	.....	7.30	.65	14,325	.....
			21.00	.....			14,310	.....
Average.....			21.10	.....			14,317	.....
True volatile			19.80	.....				.....

Date received, Jan. 2, 1912.

Date reported, Jan. 9, 1912.

Remarks:.....

#### CALCULATED RESULTS.

1.6		
19.7	20.1	
7.3	7.4	
.65	.65	
14,270	14,510	15,660



tematically duplicating his results, and if any result looks doubtful, it is immediately checked.

In connection with the checking above referred to, the sampling is also checked in so far as possible. A new laboratory sample is taken from the original "2-pound" sample and is analyzed as if it were another sample. This method gives an independent check on the work as a whole. A special calorimeter has been constructed along most approved scientific lines with a view to the greatest accuracy and without regard to the saving of time in operation. This instrument is equipped with a delicate platinum resistance thermometer, and is used only to check the work of the routine instruments. Whenever possible, duplicate determinations are made by different chemists using different apparatus, thus eliminating the element of personal error.

#### **REPORT OF ANALYSES.**

The analyses are reported to the engineer in charge by identification number only, are then properly recorded with respect to delivery points, and the results of the tests and analyses are reported to the proper branch of the Federal service.

## PUBLICATIONS ON FUEL TESTING.

### PUBLICATIONS OF THE BUREAU OF MINES.

The following publications may be obtained without cost by applying to the Director, Bureau of Mines, Washington, D. C.

BULLETIN 1. The volatile matter of coal, by H. C. Porter and F. K. Ovitz. 1910. 56 pp., 1 pl.

BULLETIN 2. North Dakota lignite as a fuel for power-plant boilers, by D. T. Randall and Henry Kreisinger. 1910. 42 pp., 1 pl.

BULLETIN 3. The coke industry of the United States as related to the foundry, by Richard Moldenke. 1910. 32 pp.

BULLETIN 4. Features of producer-gas power plant development in Europe, by R. H. Fernald. 1910. 27 pp., 4 pls.

BULLETIN 5. Washing and coking tests of coal at Denver, Colo., by A. W. Belden, G. R. Delamater, J. W. Groves, and K. M. Way. 1910. 62 pp.

BULLETIN 6. Coals available for the manufacture of illuminating gas, by A. H. White and Perry Barker. 1911. 77 pp., 4 pls.

BULLETIN 7. Essential factors in the formation of producer gas, by J. K. Clement, L. H. Adams, and C. N. Haskins. 1911. 58 pp., 1 pl.

BULLETIN 8. The flow of heat through furnace walls, by W. T. Ray and Henry Kreisinger. 1911. 32 pp.

BULLETIN 9. Recent development of the producer-gas power plant in the United States, by R. H. Fernald. 82 pp., 2 pls. Reprint of United States Geological Survey Bulletin 416.

BULLETIN 11. The purchase of coal by the Government under specifications, by George S. Pope. 80 pp. Reprint of United States Geological Survey Bulletin 428.

BULLETIN 12. Apparatus and methods for the sampling and analysis of furnace gases, by J. C. W. Frazer and E. J. Hoffman. 1911. 22 pp.

BULLETIN 13. Résumé of producer-gas investigations, October 1, 1904, to June 30, 1910, by R. H. Fernald and C. D. Smith. 1911. 378 pp., 12 pls.

BULLETIN 14. Briquetting tests of lignite, at Pittsburgh, Pa., 1908-9; with a chapter on sulphite-pitch binder, by C. L. Wright. 1911. 64 pp., 11 pls.

BULLETIN 16. The uses of peat for fuel and other purposes, by C. A. Davis. 1911. 212 pp., 1 pl.

BULLETIN 19. Physical and chemical properties of the petroleum of the San Joaquin Valley, Cal., by I. C. Allen and W. A. Jacobs, with a chapter on analyses of natural gas from the southern California oil fields, by G. A. Burrell. 1911. 60 pp., 2 pls.

BULLETIN 21. The significance of drafts in steam-boiler practice, by W. T. Ray and Henry Kreisinger. 64 pp. Reprint of United States Geological Survey Bulletin 367.

BULLETIN 23. Steaming tests of coals and related investigations, September 1, 1904, to December 31, 1908, by L. P. Breckenridge, Henry Kreisinger, and W. T. Ray. 1912. 380 pp., 2 pls.



BULLETIN 24. Binders for coal briquets, by J. E. Mills. 56 pp. Reprint of United States Geological Survey Bulletin 343.

BULLETIN 27. Tests of coal and briquets as fuel for house-heating boilers, by D. T. Randall. 44 pp., 3 pls. Reprint of United States Geological Survey Bulletin 366.

BULLETIN 28. Experimental work conducted in the chemical laboratory of the United States fuel-testing plant at St. Louis, Mo., January 1, 1905, to July 31, 1906, by N. W. Lord. 51 pp. Reprint of United States Geological Survey Bulletin 323.

BULLETIN 29. The effect of oxygen in coal, by David White. 80 pp., 3 pls. Reprint of United States Geological Survey Bulletin 382.

BULLETIN 30. Briquetting tests at the fuel-testing plant at Norfolk, Va., by C. L. Wright. 41 pp., 9 pls. Reprint of United States Geological Survey Bulletin 385.

BULLETIN 31. Incidental problems in gas-producer tests, by R. H. Fernald, C. D. Smith, J. K. Clement, and H. A. Grine. 29 pp. Reprint of United States Geological Survey Bulletin 393.

BULLETIN 32. Commercial deductions from comparisons of gasoline and alcohol tests on internal-combustion engines, by R. M. Strong. 38 pp. Reprint of United States Geological Survey Bulletin 392.

BULLETIN 33. Comparative tests of run-of-mine and briquetted coal on the torpedo boat *Biddle*, by W. T. Ray and Henry Kreisinger. 50 pp. Reprint of United States Geological Survey Bulletin 403.

BULLETIN 34. Tests of run-of-mine and briquetted coal in a locomotive boiler, by W. T. Ray and Henry Kreisinger. 33 pp. Reprint of United States Geological Survey Bulletin 412.

BULLETIN 35. The utilization of fuel in locomotive practice, by W. F. M. Goss. 29 pp. Reprint of United States Geological Survey Bulletin 402.

BULLETIN 37. Comparative tests of run-of-mine and briquetted coal on locomotives, by W. F. M. Goss. 58 pp., 4 pls. Reprint of United States Geological Survey Bulletin 363.

BULLETIN 39. The smoke problem at boiler plants, a preliminary report, by D. T. Randall. 31 pp. Reprint of United States Geological Survey Bulletin 334, revised by S. B. Flagg.

BULLETIN 40. The smokeless combustion of coal in boiler furnaces, with a chapter on central heating plants, by D. T. Randall and H. W. Weeks. 188 pp. Reprint of United States Geological Survey Bulletin 373, revised.

TECHNICAL PAPER 1. The sampling of coal in the mine, by J. A. Holmes. 1911. 18 pp.

TECHNICAL PAPER 2. The escape of gas from coal, by H. C. Porter and F. K. Ovitz. 1911. 14 pp.

TECHNICAL PAPER 3. Specifications for the purchase of fuel oil by the Government, with directions for sampling oil and natural gas, by I. C. Allen. 1911. 13 pp.

#### PUBLICATIONS OBTAINABLE FROM THE SUPERINTENDENT OF DOCUMENTS.

The following publications of the United States Geological Survey may be obtained by sending the price, in cash, to the Superintendent of Documents, Government Printing Office, Washington, D. C.

PROFESSIONAL PAPER 48. Report on the operations of the coal-testing plant of the United States Geological Survey at the Louisiana Purchase Exposition, St. Louis, Mo., 1904; E. W. Parker, J. A. Holmes, M. R. Campbell, committee in charge. 1906. In three parts. 1492 pp., 13 pls. \$1.50.

BULLETIN 261. Preliminary report on the operations of the coal-testing plant of the United States Geological Survey at the Louisiana Purchase Exposition, in St. Louis,

Mo., 1904, E. W. Parker, J. A. Holmes, M. R. Campbell, committee in charge. 1905. 172 pp. 10 cents.

BULLETIN 290. Preliminary report on the operations of the fuel-testing plant of the United States Geological Survey at St. Louis, Mo., 1905, by J. A. Holmes. 1906. 240 pp. 20 cents.

BULLETIN 325. A study of four hundred steaming tests made at the fuel-testing plant, St. Louis, Mo., 1904, 1905, and 1906, by L. P. Breckenridge. 1907. 106 pp. 20 cents.

BULLETIN 332. Report of the United States fuel-testing plant at St. Louis, Mo., January 1, 1906, to June 30, 1907; J. A. Holmes, in charge. 1908. 299 pp. 25 cents.

BULLETIN 336. Washing and coking tests of coal and cupola tests of coke, by Richard Moldenke, A. W. Belden, and G. R. Delamater. 1908. 76 pp. 10 cents.

BULLETIN 362. Mine sampling and chemical analyses of coals tested at the United States fuel-testing plant, Norfolk, Va., in 1907, by J. S. Burrows. 1908. 23 pp. 5 cents.

BULLETIN 368. Washing and coking tests of coal at Denver, Colo., by A. W. Belden, G. R. Delamater, and J. W. Groves. 1909. 54 pp., 2 pls. 10 cents.

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