

Assume that the coal is delivered in lighters, holding 500 tons each (most lighters hold considerably more), and that a chemical analysis and a heating power test are made on each lighter of coal. The usual charge of reputable chemical laboratories for proximate analysis and determinations of sulphur and heating power is about \$25 per sample; this includes sampling. For the 20 analyses and tests from 20 lighters (10,000 tons) there would be a charge of \$450. Then:

|                                                                     |         |
|---------------------------------------------------------------------|---------|
| Gain to dealer by substituting coal A for coal C, as per above..... | \$2,625 |
| Cost of analyses.....                                               | 450     |

|                                                  |         |
|--------------------------------------------------|---------|
| Saved to consumer by scientific examination..... | \$2,175 |
|--------------------------------------------------|---------|

#### OTHER CONSIDERATIONS THAT AFFECT THE VALUE.

The above demonstration is based entirely on the heating power of the coals as expressed in British thermal units. However, other considerations affect the comparative values of coals which may show slight differences in B.t.u. One of these is the cost of ash removal. Take the following two analyses by way of example:

|       |      |       |       |       |      |        |
|-------|------|-------|-------|-------|------|--------|
| D.... | 0.95 | 14.61 | 71.80 | 12.64 | 2.46 | 13,532 |
| E.... | 4.69 | 38.06 | 54.23 | 3.02  | 0.59 | 13,390 |

These two coals show little difference in B.t.u., with a small balance of 142 B.t.u. per pound in favor of D. The determining factor here in the proper valuation of these two coals is the ash. Suppose both these coals to be offered at \$3 per ton, and the cost of disposing of the ashes to be 25 cents per ton. Then:

|                                                                  |             |
|------------------------------------------------------------------|-------------|
| 10,000 tons of coal D,<br>at \$3 per ton.....                    | \$30,000 00 |
| 1,264 tons of ash to be<br>removed (12.64%),<br>at 25 cents..... | 316 00      |

|                                                               |             |
|---------------------------------------------------------------|-------------|
| Total cost of using<br>10,000 tons coal<br>D.....             | \$30,316 00 |
| 10,000 tons of coal E,<br>at \$3 per ton.....                 | \$30,000 00 |
| 302 tons of ash to be<br>removed (3.02%), at<br>25 cents..... | 75 50       |

|                                                   |             |
|---------------------------------------------------|-------------|
| Total cost of using 10,<br>000 tons of coal E.... | \$30,075 50 |
|---------------------------------------------------|-------------|

|                                |          |
|--------------------------------|----------|
| Saved by buying<br>coal E..... | \$240 50 |
|--------------------------------|----------|

Let us now consider the coal from the standpoint of the moisture content. Since water is what is used to put out fires, it requires no great amount of argument to demonstrate that it is not a desirable feature to have present in coal. And no manager or superintendent will knowingly buy water which he does not want at the price of coal. Without consideration of the amount of heat required to evaporate the moisture in coal, let us figure the cost of two coals on the "dry basis." Take the following analyses:

| Sample | Mois-<br>ture. | Volu-<br>tile. | Car-<br>bon. | Ash.  | Sul-<br>phur. | Heating<br>Power<br>B.t.u. |
|--------|----------------|----------------|--------------|-------|---------------|----------------------------|
| F....  | 4.69           | 38.06          | 54.23        | 3.02  | 0.59          | 13,390                     |
| G....  | 0.32           | 16.26          | 72.93        | 10.49 | 1.98          | 13,995                     |

Suppose both these coals to be offered at \$3 per ton:

Ten thousand tons of coal F carries 469

tons of water (4.69 per cent.) at \$3—\$1,407, leaving 9,531 tons of dry coal for \$30,000, i.e., raising the price per ton of dry coal to \$3.15.

Ten thousand tons of coal G carries 32 tons of water (0.32 per cent.) at \$3—\$96, leaving 9,968 tons of dry coal for \$30,000, i.e., raising the price per ton of dry coal to \$3.01.

|                                                                             |         |
|-----------------------------------------------------------------------------|---------|
| In 10,000 tons of coal F, you pay for<br>the 469 tons of water, at \$3..... | \$1,407 |
| In 10,000 tons of coal G, you pay for<br>the 32 tons of water, at \$3.....  | 96      |

|                                                      |         |
|------------------------------------------------------|---------|
| Saved by not buying 437 tons of<br>water at \$3..... | \$1,311 |
|------------------------------------------------------|---------|

Other determining features as to the value of coals, while not capable of such accurate demonstration on paper in dollars and cents, may be readily seen from observation of the heavy, black smoke issuing from a chimney, the corroded condition of the grate-bars, the excessive amount of clinker, etc. These conditions can be foreseen by chemical examination of the coal and of its ash and these undesirable elements also forestalled.

Of course, it will be readily understood, that coal cannot satisfactorily be contracted for on fixed percentages of the constituents shown by chemical analysis, because, as was stated before, coal is a natural product and bound to vary somewhat in its composition. The method giving the greatest satisfaction to both buyer and seller is a specification stating the constituents of a "standard" coal at a fixed price, with a sliding scale of premiums for exceeding the standard and deductions for falling below it. This is the plan adopted by many large coal consumers and is being gradually adopted by many more to their pecuniary advantage.—Power.

### Forcing Boilers

Suppose a boiler plant, including housing, piping, accessories, etc., to cost \$25 per h.p., and suppose it to be charged 12 per cent. per annum for interest upon the investment, depreciation, taxes, insurance, etc.; there will be a charge per rated h.p. of \$3 per year, whether the boilers do any work or not.

Suppose that when it was running at its rated capacity it took four, and at double its capacity it took four, and at double its capacity 4½ pounds of coal per h.p. hour. If coal is worth \$4 per ton, or one-fifth of a cent. per pound, it will cost one-tenth of a cent. more per hour per h.p. in fuel to run the boiler at twice its rating. If it ran this way 3,000 hours per year, it would cost \$3 more per year in fuel, and the case would be equal as between loss of efficiency from overcrowding and increased standing charges by doubling the plant.

The importance of the standing charge increases as the load factor becomes less. It is expensive to buy and install a lot of extra boilers to be used but a fraction of the time on the peak of the load. Such boilers involve not only their standing charge of 12 per cent. or so, but the coal used in keeping them banked during the large part of the time that they are not in service, and the radiation from themselves and the additional piping which they require. It is not to be wondered at, then, that managers of plants with a widely varying load prefer to force

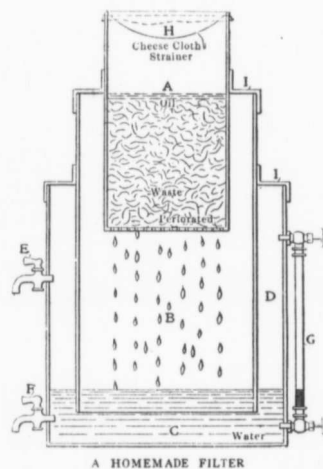
boilers upon the peak of the load to putting in a large surplus to be cut in and out.

These considerations have led to considerable modification in power plant practice. The ratio of heating to grate surface has been cut down, and more coal burned per square foot of grate and of heating surface. At the Interborough (New York) station, Mr. Scott has installed a Roney furnace under each end of a Babcock & Wilcox boiler. At the proposed extension of the Delray station of the Detroit Edison Co., combined Stirling boilers with doubleside grates will be used. At the Quarry street station of the Chicago Edison Co. the ratio of boiler to turbine h.p. will be, it is said, extremely low, confidence in the result being warranted by their experience in the Commonwealth station.—Power.

### A Homemade Filter

By E. EWING.

A few years ago I had charge of a power plant and had quite a lot of oil which had been used, but was dirty. I wished to buy a filter, but was told I could not have one. As there were some empty transformer-oil cans



lying around, I made a filter out of 2-, 5-, and 10-gallon cans. The sketch shows how it operated. It would filter 6 quarts of oil in 24 hours, leaving the oil as clear and clean as when it came from the dealer.

The cans were placed one inside the other as shown. The bottom of can A was perforated, and two-thirds filled with waste; a cheesecloth strainer was placed at H. At I lugs were soldered on to hold the cans up to a proper height. The bottom can was partly filled with water to break up the oil and wash it. At G is a gauge glass; F is a faucet to draw off sediment, and clean out; E is a faucet for clean oil.

I found that 90 per cent. of the dirt was removed by the waste and cheesecloth strainer. The bottom of can B was cut out and brought to within 2 inches of the bottom as at C. The weight of the oil in B forced the oil through the water into D. The cheesecloth strainer and the cans were removable, which made cleaning convenient. A cover was made to go on at H.—Power.