state that the efficiency of gas-fired boilers averages from 80 to 85 per cent., so that the combined efficiency of separate producer and boiler will therefore be 68 to 72 per cent. And, further, if Bonecourt surface combustion is applicable, then the combined efficiency would be in the neighborhood of 90 per cent. Whether Bonecourt's system can be applied depends on the quantity of dust and carbonaceous matter that may be discharged with the gas from the producer.

There is another method of using lignite for raising steam, and this is by using dust fuel. Lignite, in this case, would have to be dried and pulverized and the makers claim this can be done effectively and cheaply. The appliance which disintegrates the coal also acts as a fan and blows the fuel along into a burner fixed in the centre of a specially designed vertical boiler, and there ignited.

Four tests were made in Johannesburg, South Africa, with coal of the following composition:—

Moisture	2.15%
Volatile matter	22.80%
Fixed carbon	57.55%
Ash	17.50%

The average results of these tests were:—

Duration of tests in minutes	95
Steam pressure, in lbs. absorbed	189
Steam temperature, in deg. Fahr.	576
Feed water temperature, in deg. Fahr.	70
Percentage of CO_2, in flue gas	16.8
Factor of evaporation	1.265
Coal fixed per hour, in lbs.	3,451
Water evaporated per hour actual, in lbs.	25,190
Water evaporated from and at 212 deg. F., in lbs.	31,860
Water evaporated per lb. coal actual, in lbs.	7.30
Water evaporated from and at 212 deg. F., in lbs.	9.24
Net efficiency, per cent.	80.4

It will be unnecessary to discuss further the question of generating power by means of steam boilers or gas producers and sufficient proofs have been submitted to show that it is possible and in view of the cost of imported fuel and local conditions it is also cheap.

Before proceeding to another phase of the problem of using lignite, it may be desirable to submit a few points which might be profitably debated.

1. Lignite is a highly oxygenated fuel, containing a large proportion of volatile matter and moisture.

2. The efficient consumption of lignite for raising steam is dependent on the furnaces and boilers being specially adapted for its use.

3. If lignite is used in the solid form, there should be a large grate area, deep, fuel bed, efficient air preheater, and an ample sized combustion chamber.

4. Lignite is adapted for generating power by means of gas producers and engines. The producers, etc., must be designed for this particular fuel, as the grate area must be larger, fuel bed deeper, less steam is required and less tar is produced.

5. Ample provision should be made for reducing the formation of clinker and for its removal by mechanical means, because, barring by manual labor is both inefficient and expensive.

6. More economical development of power from lignite appears to be possible when the surplus heats are absorbed by suitable economizers, etc.

7. The most promising method of developing power from lignite on a large scale is by gas producers and engines with the installation of waste heat utilizers, together with steam boilers and engines.

8. Every unit of increase thermal efficiency obtained with any type of power plant means a tangible saving in dollars and cents for the steam user.

There is another method of using lignite and that is by converting it into gas by ordinary distillation process. This has been fully set out in the report and consequently only a general reference to this subject can be made to-night.

It is a question for the public to decide whether they want artificial gas of the same quality as is made in other Canadian cities, which can be used for lighting, cooking, heating and power, and which will cost more to supply owing to the great distance from which the gas-coal must be brought, or an artificial gas possessing small illuminating power but of good enough quality for heating, cooking and power, made from local fuel and costing less to supply. Natural gas is, of course, superior to both.

Lignite gas, which name is applied advisedly to differentiate it from ordinary coal-gas, can be made in an ordinary gas works plant, but the heat required for distillation will probably be less and therefore the cost of production will be less. Moreover, as lignite distils more quickly than ordinary gas coal, more gas can probably be made in a given time, and therefore smaller plant will be necessary. If the public should desire the lignite gas to be richer in lighting power, then it can be enriched at small cost.

Gas work may not be so familiar to some of you as steam and producer plants and therefore a short elementary description will be given of the process.

The gas works plant consists of retort benches, exhauster, condensers, scrubbers, washers, purifiers, station meter and gas holder with tanks for tar and ammoniacal liquor, all of which are connected together by pipes.

The retort benches are virtually ovens in which are placed a number of fire-clay retorts built over a furnace. These retorts are either circular, D shaped, or oval, in cross section. They are often "singles," that is, they are closed at one end and fitted with a cast iron mouthpiece at the other; in other places two retort benches are placed back to back and the retorts are "throughs," that is, they are open from mouthpiece to mouthpiece. There are flues from the furnace beneath surrounding these retorts to heat them. These furnaces, in small work, are direct fired with coke, but in larger work regenerative and producer furnaces are built with passages to preheat the air so that when the gases from the furnace meet and mix with the hot air, and burn in the combustion chamber, intense heat is generated. This is circulated around the retorts and finally passes up the chimney stack.

Retorts are usually laid horizontally but sloping retorts are in use, as well as chamber retorts. The latest development is the vertical retort, which consists of fire-clay rings surrounded by flues. These verticals are heated by producer furnaces, and as the coal is carbonized into coke, it gradually falls in the chamber. Outside the lower part of the vertical retort there are flues to preheat the air, and this at the same time cools the coke, so that when it is discharged it requires very little quenching.

Returning again to the horizontal retort, coal is charged into it, and the lid on the mouthpiece closed and made air-tight. The externally applied heat causes the coal to be carbonized or distilled, gases and vapors are driven out and as there is but one outlet they perforce must travel up the ascension pipe from the mouthpiece into the hydraulic main when the heavier hydrocarbons and some vapor are condensed and deposited.

As the gas would, in the absence of pumps, have to force its way through water in the hydraulic main and through the condensers, washers, scrubbers, purifiers, meter and into the gas holders. There would naturally be some back pressure thrown on the retort and this would reduce the quantity and quality of the gas produced from each ton. So, an exhauster is installed, the function of which is to pump the gas out of the retort and thereby to keep the pres-