latter appeals to me most from my own experience, and makes the fire settle down mose solidly after its use, also keeping the bricks freer from clinkers.

II. The first fact I referred to was purely a commercial coincident, due to local circumstances, and easily remediable if taken in time. The second is the fact that the incombustible constitutent of Pennsylvanian coals fuse to clinker at a lower temperature than do those from Wales, and, therefore, we **must** in this country keep the temperature down to a proportionately low level, depending on these critical temperatures. You will see that a larger producer will, as it happens, effect this result without further attention. A further fact for which I have not found a really satisfying reason is that an increase in the height of the producer improves the working of producers with Canadian fuel immensely.

I would like to hear a few suggestions on this subject. It is not as if the proportion between height and diameter had been kept constant. The height for Canadian anthracite is considerably more in proportion to the diameter than with English anthracite. To sum up all my experience and the remarks previously made, I would specify for a successful producer on Canadian anthracite:—

1. That the diameter and height of the plant should be ample.
2. That gauges should be installed, and intelligently used.
3. That the hand-fan should be motor-driven.
4. That all bends should be cleaning bends.
5. That the water supply for the boiler should be under automatic regulation, so that the steam generated should be in strict proportion to the load.
6. That all test-cocks be fitted with gauze, applying Davy's well-known principle to prevent explosions.
7. That all joints be designed so that possibilities of leaks are reduced to a minimum.

Given all these points and handled by an intelligent man, a suction anthracite or coke plant is the simplest and most efficient equipment in conjunction with a gas engine that can be obtained.

Now, anthracite and coke are all right as fuels, and, in fact, ideal, but, like all things ideal, they are expensive, and the more people realize their possibilities in producers the more expensive will they become, so that it has been the object of every up-to-date firm in the business to put on the market a plant which will use bituminous coal as well. The company with whom I am associated has been grappling with this problem for years, and now they have plants of 50 horse-power up to any size for this class of fuel, arranged again on the three principles of suction, suction pressure, and pressure.

The use of bituminous fuel in large plants has been solved for quite a number of years by such firms as Crossley Bros., the Power Gas Corporation, etc., and the horse-power of these plants already in use runs into hundreds of thousands, and is constantly increasing, but there has, till the last few years, been a disposition not to build them much below three or four hundred horse-power.

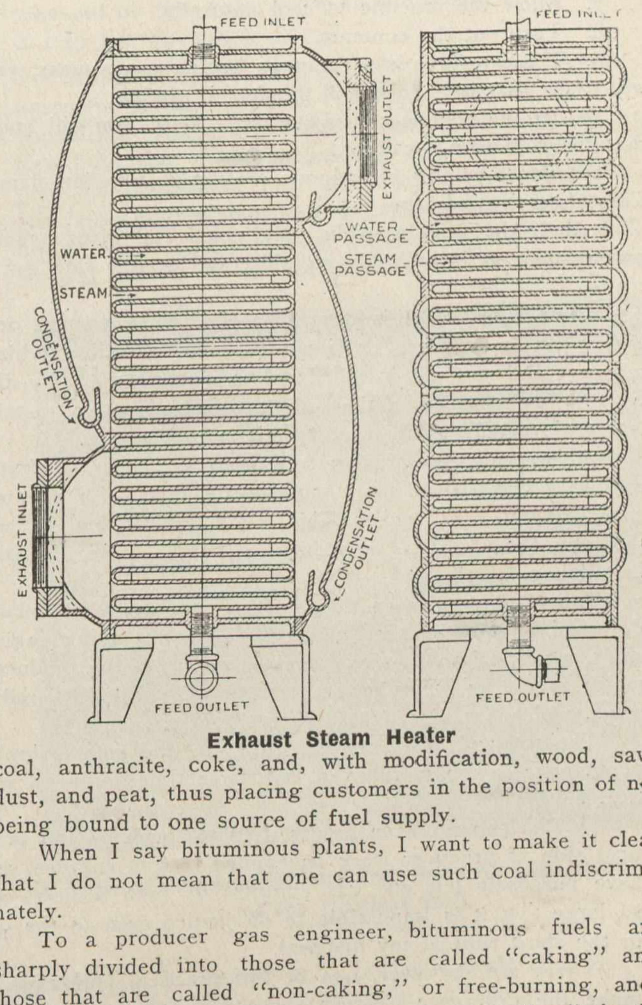
In the solution of this problem of using bituminous fuel there have been two schools of thought, and nearly everyone has started by being a strong adherent of the one, and, after thinking they had solved the problem, have gone over to the other, which, so far, has proved the only truly satistory system.

The first idea was to make gas, either in one producer and pass those gases through a second producer, which was maintained at a high temperature, and there convert the volatile and tarry constitutents into a permanent gas, or to carry out practically the same process in one producer by having two zones: the one a gas-making zone, the other a zone at a high temperature, for what we call cracking the tarry matter into permanent gas, so adding the heat value of these constituents to the sum total of B.t.u. of the gas, and at the same time removing all chances of trouble from tar on the engine piston or in the pipe system.

The idea is fascinating and apparently simple, but in practice it does not work, and you will find, as I have said, that when you inspect such plants they have always in addition a number of special washers to take out the tar, which was supposed to be removed by the second producer, or double zone system.

The second process is to combine with your bituminous producer a slow-speed centrifugal water-fed fan, which intimately mixes the gas with a water spray and removes all particles of tar.

This tar extractor is a simple machine, and by its use in combination with their bituminous producers the makers can supply plants as small as 50 B.h.p. to use bituminous



Exhaust Steam Heater

coal, anthracite, coke, and, with modification, wood, sawdust, and peat, thus placing customers in the position of not being bound to one source of fuel supply.

When I say bituminous plants, I want to make it clear that I do not mean that one can use such coal indiscriminately.

To a producer gas engineer, bituminous fuels are sharply divided into those that are called "caking" and those that are called "non-caking," or free-burning, and, although in actual fact these fuels are generally distinctly different in their behaviour under certain tests, cases occur where it is difficult to say to which class they belong, and then a test with a bulk sample under actual working conditions is the only reliable data on which to depend.

Roughly speaking, the practical engineer can, by a test, find whether a fuel is caking or non-caking, but before I give you the test, I will give a rough definition of the two terms:—

I. A caking fuel is a fuel that, when heated, does not retain its original shape, but runs together into a homo-