DOWSON'S GAS PRODUCER.

We annex illustrations of the latest form of gas producer designed by Mr. J. Emerson Dowson, of 3 Great Queen Street, Westminster, and especially adapted for supplying gas engines.

The engines of this kind made by Messrs. Crossley Brothers, of Manchester, are known to have a very high efficiency. The power required at these works will probably be 200 to 300 horse power, and Messrs. Crossley have decided not to employ steam, but to drive all their machinery and tools with gas engines. Several preliminary trials were made with the gas produced in the Dowson apparatus, and the results were so satisfactory that it has been adopted for permanent work, and already nearly all the gas producing plant for 150 horse power has been laid down.

An engine, indicating from 27 to 30 horse power, has been working regularly with this cheap gas over two months. During this time tests have been made to determine the actual fuel consumption, and the following are the results obtained, so says *Engineering*:

1. Time allowed to get generator fire in order for making good gas, 45 minutes.

2. Fuel consumption per 1,000 cubic feet passed into gas holder, 13·2 lb.

3. Gas consumption per indicated horse power per hour, 109 cubic feet.

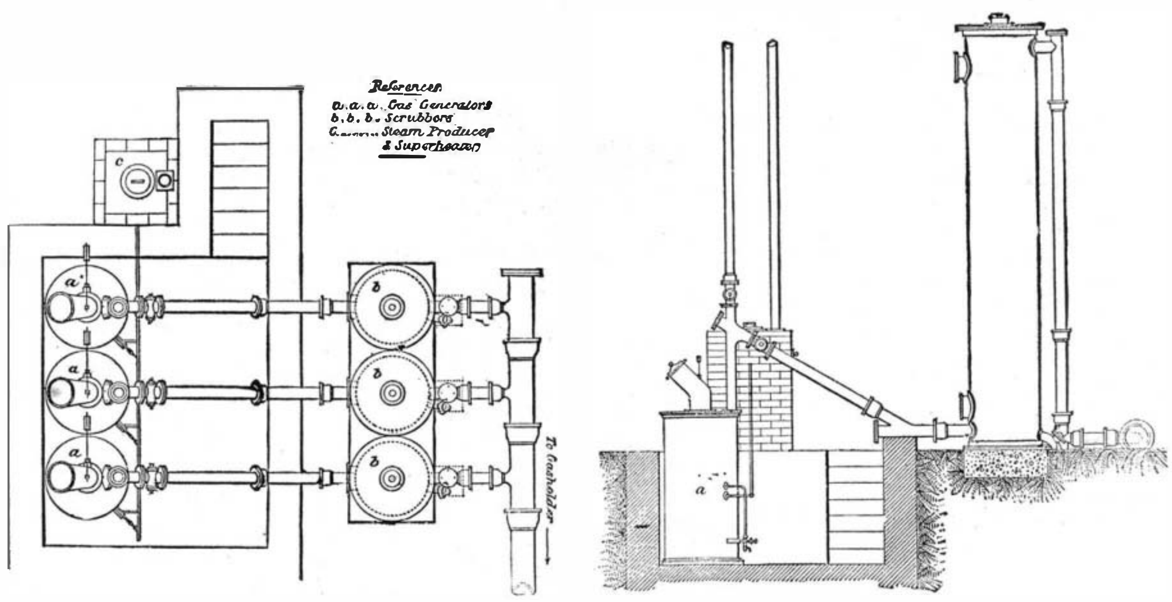
4. Fuel consumption per indicated horse power per hour, 1·4 lb.

These results confirm the tests made by Mr. D. K. Clark, for the Committee of the Smoke Abatement Exhibition, with a 3½ horse power Otto engine worked with the cheap gas. He gave the following: 1. Gas consumption per indicated horse power per hour, 110·3 cubic feet. 2. Fuel consumption per indicated horse power per hour. 1·4 lb.

The engine now working with this gas at Messrs. Crossley's new works is driving the foundry blower, which delivers an average of about 4,000 cubic feet of air per minute, and a mercury gauge indicates with accuracy the steadiness of the driving. The fuel used in the gas generators is small sized anthracite from South Wales, costing 3s. 3d. a ton in truck at the pit.

It will be seen that the fuel consumption is remarkably low, even with so small an engine as a 3½ horse power, as reported by Mr. D. K. Clark. The wages of the firemen for the gas generators are not more than for a set of steam boilers. It should also be mentioned that the gas can be conveyed to any part of the works without condensation, that separate engines can be used for different lines of shafting, and that this not only effects a saving in the cost of shafting, but any department working overtime can have its engine supplied with gas from a single gas generator.

The arrangement of the plant will be understood from the drawing, in which *a a a* are three producers, cylindrical iron chambers, lined with ganister, closed at the top, and provided with grate bars near the bottom, on which the anthracite, fed in from the hoppers at the top, is consumed. Steam is generated in a coil contained in the square furnace, *c*, and is led away by the steam pipe shown, provided with jets discharging into each producer, and drawing with this a considerable quantity of air. The gases generated are led off to the pump gear, *c c c*, and then to the holder (not shown in the drawing). From this holder the supply is delivered as required to the gas engines.



DOWSON'S GAS MAKING PLANT.

The Girls should Exercise.

Dr. Alice F. Freeman, of Wellesley College, says that the cause of the breaking down of the girls in institutions of learning is the lack of proper physical care before entering. Experience shows that in the boarding schools where exercise is compulsory the students improve in health, but college is not a place for invalids, and those with weak constitutions and nervous prostration are likely to become ill. Girls have not as vigorous a physique as boys, but they are capable of greater endurance, and with proper care can sustain as thorough a course of mental training with benefit rather than detriment to their health.

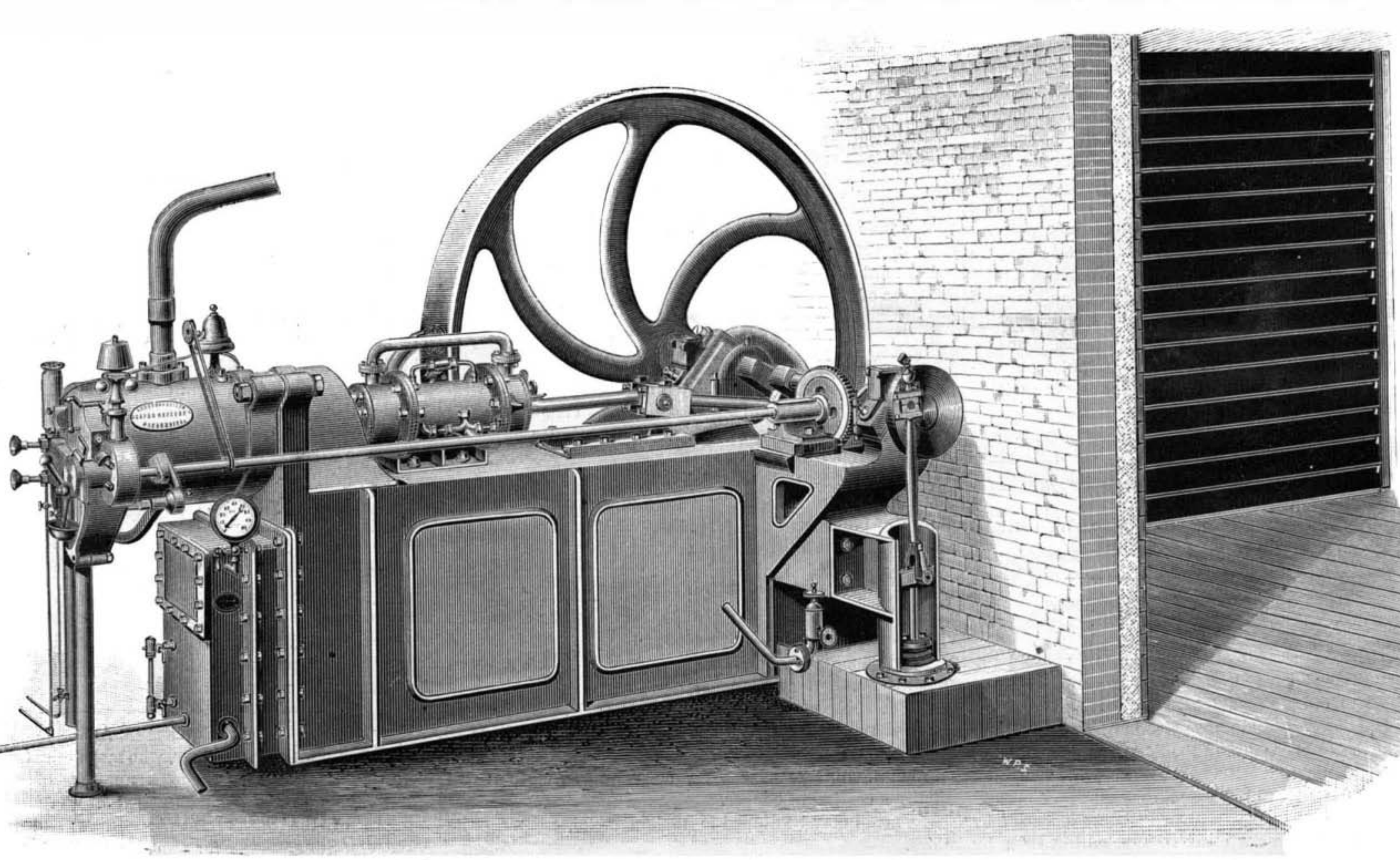
COMBINED GAS MOTOR AND REFRIGERATOR.

Our engraving shows a perspective view of the apparatus, together with a portion of the cooling chamber. The machinery which has to be driven is of the well-known Bell-Coleman type, and we need only here observe that the essential feature of the process consists in drying the air before expansion. This is carried out by passing the moist air, while in a state of compression, through a series of tubes placed in a colder atmosphere, or waste air current from the chamber, which causes the moisture to deposit on the surface of the tubes, whence it is removed by automatic traps before entering the expansion cylinder. The pipes have also the effect of considerably reducing the temperature of the compressed air below the temperature of the cooling water, and, consequently, when permitted to expand, it produces proportionably lower terminal temperatures, thus giving greater efficiency per indicated horse power.

On reference to our engraving, it will be seen that an air compressor is placed on the top of the bed frame, and the gas motor cylinder is placed on the same line as the compressor at one end of the bed frame, which it overhangs, as is usual in the Otto engine. The piston of the gas motor cylinder is on the same rod as the piston of the compressors, and this rod is connected to the crank shaft by a connecting rod. On one end of the crank shaft there is a fly wheel, and at the other end of the shaft a crank disk, to which is attached at right angles the connecting rod and piston of the cylinder, in which the compressed air (after having been deprived of the heat produced during compression) is expanded in the act of doing work. The valve gear of the gas motor is that usually adopted in the Otto engine. The process may be briefly described as follows:

Atmospheric air is taken into the compressor, and therein compressed to about 4½ atmospheres absolute, or say 50 pounds above atmospheric pressure. A considerable amount of heat is produced in this operation, which is removed from the compressed air by water, and to such an extent as to make the temperature of the air, after compression, about the temperature of the water used in cooling, which is generally from 60° to 80° in ordinary practice. The object is effected by forcing water partly into the compressor and partly into the air immediately after leaving the compressor, the operation being completed and the surplus removed in the usual way in a chamber connected with automatic water traps. The compressed air, now free from mechanically suspended water, and still under compression, is led through horizontal pipes fixed in the sole plate, and which are surrounded by cold air returning from the room being refrigerated. The pipes act as heat exchangers, and also as moisture depositors, as they reduce the temperature of the compressed air considerably below that of the water.

The compressed dry air, which in ordinary practice is now generally of a temperature of 50° above zero, is taken to the expanding cylinder, constructed on the type of a steam cylinder, where it is expanded, and power is developed by the expansion, the power being utilized in the driving of the whole machine through the crank shaft, the air at the same time being reduced from 50° above zero to 50° below zero. The machine which has been erected in Leadenhall Market is employed in cooling a chamber which contains poultry and game. The compressor of this machine is 8½ inches diameter and 12 inches stroke; the expansion cylinder is 6 inches diameter and 9 inches stroke. It delivers



COMBINED GAS MOTOR AND REFRIGERATOR.