

Mechanical Stokers

By ALFRED W. BENNIS, M.I.MECH.E., A.I.E.E.,
Bolton, Eng.

Right away from the time of James Watt until our own days—especially our own days—go-ahead engineers all over the civilised world have made ceaseless efforts to produce cheap steam with smokeless chimneys, and to secure the utmost economy in the utilisation of energy. If proof of this assertion were needed, it is furnished by the records of the Patent Office, where the number of applications for patents having this desirable object in view may be counted by thousands. Poets, novelists and practical men have, each and all, told their tale of a world in which perfect combustion is possible; and a very pretty story it is. Cleanliness, purity of atmosphere, health and happiness are the order of the day in this beautiful Utopia. Howbeit, that word Utopia it would seem, is not impossible, thanks to the inventive genius and persistent determination of the engineer, to whom we are indebted for so many wonderful accomplishments both in peace and in war.

Whilst we admit that not even the most hopeful inventor can claim for his apparatus that it fulfils ideal conditions, yet there is no doubt that excellent results can be, and are being obtained, and these frequently under the most adverse conditions. He would be an extraordinary man indeed who looked upon the average boiler as an ideal apparatus for the economical generation of steam. Let that boiler be fired with praiseworthy carefulness and incontestable skill, yet the performance of obtaining the highest calorific value from the fuel used is one which can only be carried out under laboratory conditions. But, to be sternly practical. First let us consider what an ideal mechanical stoker should fulfil, and, secondly, how far existing mechanical stokers, or that type of mechanical stoker we are specially dealing with, is able to meet the requirements of the ideal.

First, to quote the words of an eminent M.I.E.E., the ideal stoker should:—

"(1) Increase the economy in fuel when compared with hand-firing.

(2) It should secure a smokeless furnace even with bituminous coal.

(3) It should have few wearing parts.

(4) It should possess reliability.

(5) It should be self-contained.

(6) It should incur small capital cost.

(7) It should require small maintenance cost.

(8) It should be worked at small running cost.

(9) It should be provided with an adjustable feed.

(10) It should be automatic in action."

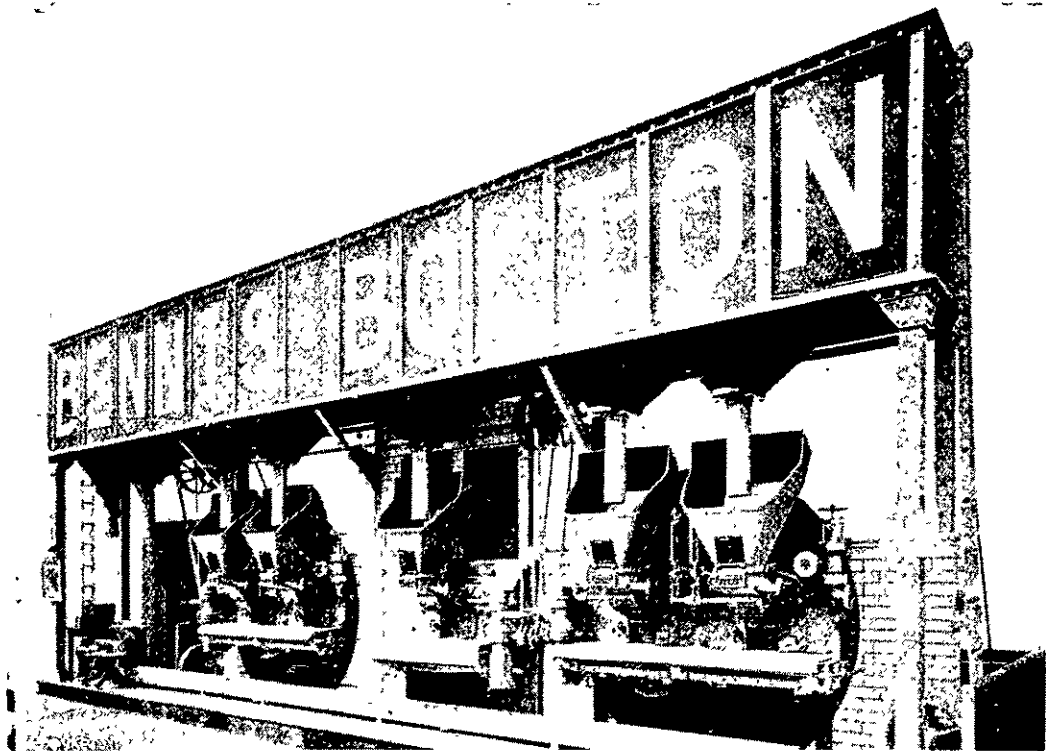
The Bennis machine stoker, illustrated on this page, is a simple and efficient machine for feeding

coals into boiler and other furnaces, and is well adapted for heat-producing purposes—furnace work, heating, puddling, forging, roasting, baking, drying, gas-producing—and also is usable in dry kilns, digestors and evaporators. In fact wherever it is possible to use coal firing, the Bennis machine stoker is guaranteed to do the stoking cheaper and more evenly, producing a steady, uniform fire all day with less coal, and without interruptions for the supply of "green" coal, and consequent variation of temperature. With

thus gives complete control over the supply of air, over the feed of coal, and over the rate of feed, so insuring complete combustion and as rapid combustion as may be desired.

Complete combustion and a perfect control of combustion were, until recently, ideals. To-day they are realised attainments with results that may be seen and tested in hundreds of important power stations and boiler houses throughout the world.

A remarkable advertisement has appeared in



AN EXHIBIT OF THE BENNIS MECHANICAL STOKERS.

this stoker fire doors can be kept closed practically all the time. The man attends to the production, but the machine does all the rest, introducing the coal automatically into the furnace in the exact places where it is most needed to secure perfect combustion, adjusting the supply of air to the fire to consume that fuel perfectly, continuously removing the clinker or ash, which it carries forward to the end of the bars and drops into a closed chamber, whence it is withdrawn once or twice a day. It has the further advantage, when fitted with a compressed air furnace, of regulating the steam blast and increasing or decreasing the quantity of steam as required. The Bennis system

the *Electrical Times* and other papers to this effect—"Record. Sheffield Electrical Lighting Station: Lowest cost per unit, .096d."

With Bennis stokers, Bennis compressed-air furnaces, patent hot-air feed to bars, and Ellis & Eaves draught system, Mr. S. E. Fedden, manager of the Sheffield Corporation Electrical Supply Department, Commercial Street, Sheffield, says in *Engineering*:—"Experience with similar machines in the Sheaf-street Station, does not lead me to fear any notable increase in the up-keep charges after the period of maintenance has expired."

This tenth of a penny unit cost, which greatly startled people interested throughout the country, can only be attributable to the fact that the plant and appliances in question were thoroughly up-to-date, and therefore made for economy."

The makers of the Bennis stoker claim that it will:

(1) Burn low grade fuel (that cannot be dealt with by hand-firing) or high grade fuels, with the utmost economy.

(2) Effect great economy in fuel.

(3) Give more steam from the boilers than can be obtained by other means.

(4) Prevent black smoke.

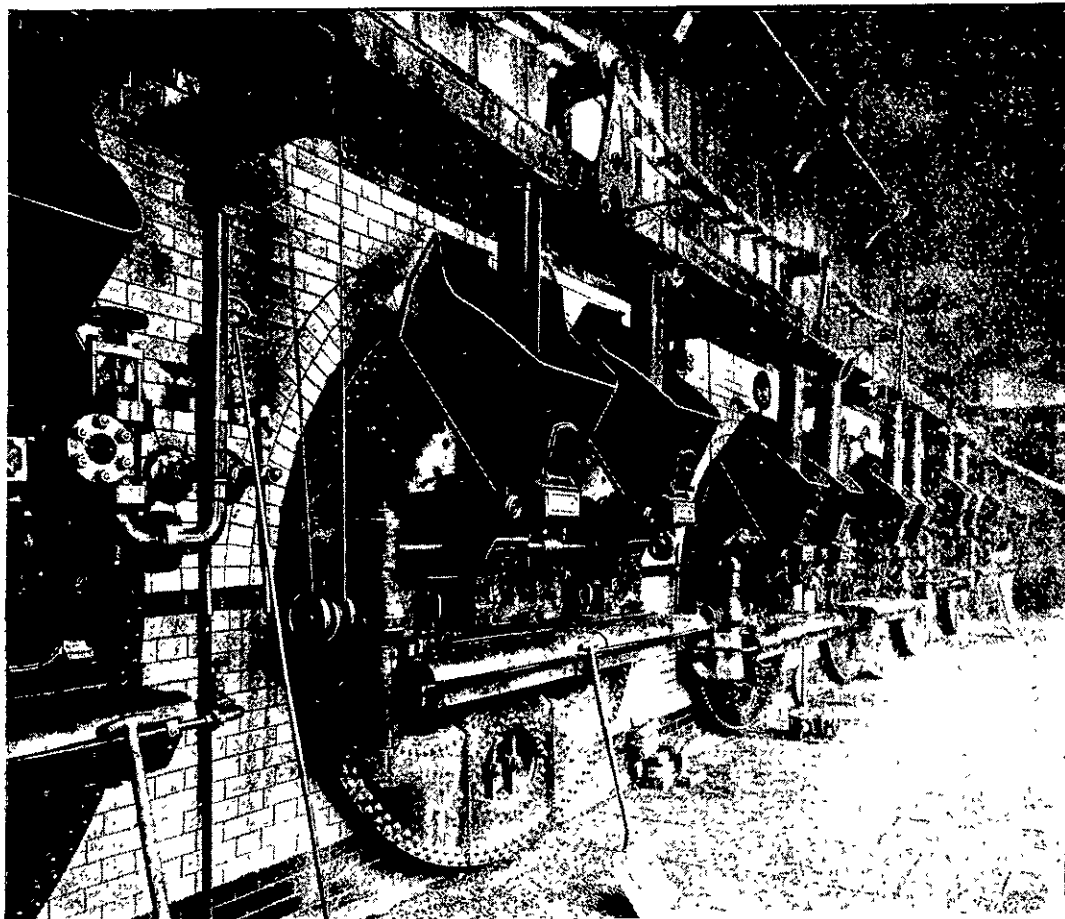
(5) Give less work to the firemen.

(6) Prolong the life of the boiler.

(7) Respond to sudden calls for steam—burning capacity usually being up to 60 lbs. of fuel per square foot of grate surface per hour. Where there is a short supply of steam, where smoke is a nuisance, where firemen have oiling and engines to attend to, where cheaper fuel can be added, where the load is very irregular and where economy is an object, it is impossible to beat, or to anything like equal the Bennis stoker and furnace. Amongst other advantages offered by the apparatus, we may mention that the cleaning out of fires is unnecessary; that each fire is under separate control; that the fire doors open outwards, as in ordinary hand-firing, and are of large size, and that the air supply to the fire and the coal supply are under immediate and simple control.

For those of our readers who are interested in a more detailed technical description, we append the following instructive account of the construction and design of the Bennis stoker fitted with pneumatic gear and self-cleaning compressed air furnace.

In this machine small fuel or slack is thrown by hand, or fed by mechanical means into a stoker hopper of about 3 cwt. capacity, of which there are only two to each Lancashire boiler. Under the hopper is a cast-iron feeding box, in the interior of which there is a simple pusher plate with an adjustable reciprocating motion. The fuel falls in front of the pusher plate, and is pushed, by its



BOILER HOUSE, WITH BENNIS STOKERS AND COAL HANDLING PLANT, AT MESSRS. MARTIN, SONS AND CO., LTD., HUDDERSFIELD, ENGLAND.