

not only plays round the whole outside, as in common boilers, but also runs along several flues which are conducted through the midst of the water. By such contrivances the fire is applied to the water in a most extensive surface, and for a long time, so as to impart to it the greatest part of its heat. So skilfully was it applied in the Albion Mills, that although it was a large engine, its unconsumed smoke was inferior to that of a very small brew-house.\* In this second engine of Mr Watt, the top of the cylinder is shut up by a strong metal plate *gh*, fig. 9. in the middle of which is a collar or box *kl*, containing a collar of hemp, surrounding the piston-rod *PD*, which being nicely turned and polished, can move up and down, without allowing any air to pass by its sides. From the dome of the boiler proceeds a large pipe *BCIOQ*, which, after reaching the cylinder with its horizontal part *BC*, descends parallel to its side, sending off two branches, viz. *IM* to the top of the cylinder, and *ON* to its bottom. At *I* is a puppet-valve opening from below upwards. At *L*, immediately

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plate, close to the burning fuel, but not upon it. When it needs mending, the burning coals and those upon the dead-plate are pushed further down without being mixed, and more coals are laid upon the dead-plate, but never should be thrown on the top of those already on fire, as that would instantly send out a volume of smoke. In this situation they are gradually dried, and any smoke which issues from them is consumed by the current of air from the fire door in passing over the bright burning fuel. The opening, or openings, to admit the air, are regulated, so as just to admit the quantity which consumes the smoke; more would be prejudicial. I originally constructed these furnaces in a somewhat different manner; but the above method has been found the most convenient, and, when properly attended to, answers the purpose perfectly with free-burning coal, but is more difficult to manage with coal which cakes." W.

\* "The engine here described is one applicable to the working on the expansive principle, in which the piston ascends in an exhausted cylinder; a vacuum both above and below the piston. To make it ascend in steam, the place of the injection must be altered, so as not to spout so high; and there must be a regulating valve at *U*, to prevent the steam going into the education-pipe until the piston has ascended to the top of the cylinder." W.