Steam Locos Without Fires

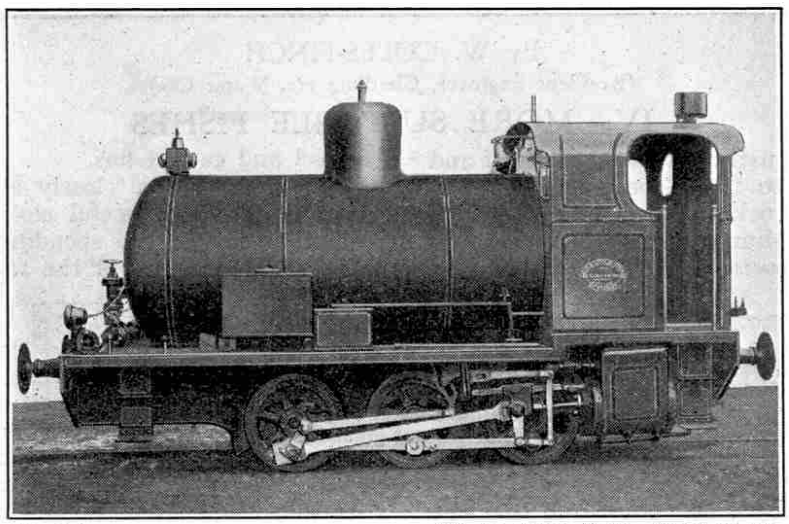
An Interesting Type of Engine used for Special Purposes

THE enormous development in recent times of explosive factories, ammunition depots, oil refineries, paper works and warehouses, in which the materials handled are either violently explosive or extremely inflammable, has created a demand for a safe motive power for shunting operations. For work in any such situation the ordinary steam locomotive is obviously out of the question on account of the danger of fire. There are strong elements of danger also in the employment of internal combustion engines, and even the apparently harmless electric motor is not entirely above suspicion.

The ingenuity of inventors has therefore produced a solution to this problem in the form of the fireless steam locomotive.

Fire Danger Eliminated

As its name indicates, the fireless steam locomotive has no fire. Thus sparks and cinders do not exist, and if the brakes and buffers are covered with some non-sparking material the fire danger is practically eliminated. In addition there is no danger of explosion. Not only is the working pressure very moderate, but, as we shall see later, it cannot rise through oversight or accident, but is always falling.



Courtesy [*Messrs. Andrew Barclay, Sons & Co. Ltd.*

Fireless Steam Loco Built for Use in a Munition Factory

Our illustration shows a typical modern fireless steam loco, built for service in a munition factory. It is of the 0-6-0 type with outside cylinders 14½ in. diameter by 18 in. stroke and slide valves actuated by Walschaerts valve gear. The wheels are 3 ft. diameter. A comfortable cab is fitted and the exhaust from the cylinders is taken by a single pipe up the cab backsheets and discharged through a patent muffler above the cab roof.

In addition to a Caledonian-type whistle there is a warning bell attached to the front of the cab, and electric headlights are fitted. Surmounting the dome is a single Ross pattern "Pop" safety valve, but this fitting is for special use only. The only other attachments are the regulator, hand-brake handle, steam gauge and sanding apparatus, so that the simplicity of control will be readily appreciated.

How the Loco Works

The principle upon which the loco works is quite simple. What appears to be a boiler of unusually great diameter is really a large cylindrical tank known as the "receiver," the greater part of which is filled with water. The receiver has rounded ends and is fitted internally with special steam distributor pipes and numerous surge plates.

The steam supply is conveniently obtained from a stationary boiler, and the short length of piping for attachment to the inlet valve, seen at the front of the loco above the buffers, is usually of a patented spherical-jointed type allowing a fair working variation in the position of the loco when being presented for charging. The water in the receiver is heated up until a pressure of 160 lb. per square inch is obtained, and the charging operation being now complete, the inlet valve is closed and the loco disconnected from the charging boiler.

The time normally required for charging when hot from, say, 15 lb. per square inch to 160 lb. per square inch, is from 15 to 20 minutes, but the initial charging from cold—which need only be done at long intervals, say after the loco has been out of commission for 10 days or more—requires about 3½ hours.

On opening the regulator, the steam passes from the dome to the cylinders just as in the case of an ordinary locomotive and after doing its work escapes through the exhaust muffle with a faint "puff."

When charged with steam the loco will perform ordinary shunting and general haulage work for three or four hours. Boosting charges can be given rapidly and whenever convenient. The power is not so great as an ordinary loco of the same dimensions, as the working pressure of the fireless loco falls gradually as the steam is used.

Work in the factory or wherever the loco is situated is very frequently arranged in such a manner that the charging is accomplished during the meal hour.

A Steam Accumulator

The fireless locomotive is really a steam accumulator, the power being stored as heat in the water in the receiver. During the working period a portion of the water in the receiver evaporates, forming the steam for driving the loco. This is due to the fact that, with water and steam in contact under pressure and at corresponding temperature, if the water be relieved even slightly in pressure a certain amount of heat is liberated, generating steam until thermal equilibrium is established. This process goes on until the pressure falls too low for further work, say about 25 lb. per square inch, at which pressure the loco is able to run light quite a long distance to the charging station.

When steam enters from the outside boiler it is condensed in the cooler water of the receiver and it gives up heat to the water until the steam pressures in both boiler and receiver are approximately equal. This is the reverse of the evaporating process that takes place during the working of the loco and it results in always maintaining approximately the same level of water in the receiver after charging.

The receiver is elaborately lagged with asbestos so that the loss of heat through radiation is practically negligible and thus, as steam is used by the regulator, more is generated to take its place. If the loco should not be needed for a period up to three or four hours it may be left without supervision and during that time there will be no appreciable falling in pressure.

Increasing Field of Employment

These locomotives are ideal shunting engines where moderate loads are to be handled and the gradients are not excessive. They must always keep within range of the boiler that charges them but are very seldom stranded for lack of steam because they are able to run light for about a mile after the pressure has dropped as low as 25 lbs. per square inch, provided the track is fairly level.

In addition to its use in munition and other factories, the fireless locomotive is finding increasing employment in factories where cleanliness is an absolute essential, and in which, quite apart from the fire danger, ordinary locos could not be used on account of smoke and fumes. There is little doubt that fireless locomotives have a great future in jute, cotton, and paper mills, biscuit factories, power stations, dye works, margarine works, soap works, oil fields and refineries, and a variety of other industries, for they can be safely run into and through the building no matter what manufacturing operations may be in progress.

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