## AUGUST, 1912.]

## CANADIAN RAILWAY AND MARINE WORLD.

## OIL BURNING LOCOMOTIVES ON THE CANADIAN PACIFIC RAILWAY.

## By Frederick H. Moody, B.A.Sc.

For the second time this year the subject of oil for fuel is being discussed in these columns. the previous instance being in the April issue, when the oil burning motor. car which the Grand Trunk Ry. is operating from Black Rock, N.Y., to Port Colborne, Ont., was described with particular reference to the motive power end with its oil fired boiler.

The equipment to be described on this occasion is that of the C.P.R., the management of which has for some considerable time been contemplating the use of fuel oil for locomotives on the British Columbia Division. Those at present equipped and in the course of equipment number 90, of which 14 are for the Esquimalt and Nanaimo Ry., on Vancouver Island. Seven stationary boilers for pumping plants at oil storage plants on the B. C. division, are also being equipped for oil burning. In view of the widespread interest being evinced in the use of oil for fuel, not only in Canada, but more narticularly in

In view of the widespread interest being evinced in the use of oil for fuel, not only in Canada, but more particularly in the southwestern part of the United States, it is the intention to include here a brief history of the use of fuel oil for railway motive power, from the time its use has been so seriously considered. this period being confined for the most part to the last decade, or slightly longer.

It is said that the first serious attempts at the use of oil fuel in the United States were in 1894 on the Southern Pacific Rd., although the Santa Fe lines experimented as far back as 1887, these early attempts being the result of a scarcity of coal and an abundance of crude oil, making the use of the latter highly desirable if some method of employing it that would prove as satisfactory as the use of coal could be devised. The 'results of many years of patient experimental work have been crowned with success, so that today, nearly all the lines in the southwestern States use crude oil as locomotive fuel, with the best of results. Since that time, the practice has been taken up by a number of other roads, among which is the C.P.R. When the first attempts of the set of

When the first attempts at the use of oil for locomotive fuel were instituted in the U.S., there was a certain amount of precedent upon which to base the designs, for it had been employed with a marked degree of success in the Baku oil fields of Russia. The great difference in the many conditions surrounding the use of oil in the two widely separated districts, with their distinctive ideals in motive power, left a great many difficulties in the path of the early experimenters, which had to be solved independently of the results obtained under the other entirely different conditions.

In the first attempts at its use, the coal burning grates were retained, but the experimenters soon learned that satisfactory results could not be obtained with the draught spread over such a wide area as that presented by the grate surface, and that it must be concentrated. The uncontrolled influx of cold air proved very detrimental to the flues, and, what was even more important, surplus oil in dripping down from the burner, instead of falling on a retaining surface where it might still burn off to advantage, dropped down into the ashpans and frequently burned in them with destructive results. Tight ashpans have been known to flood, and the overflow on the roundhouse floor and pit furnished an ever present source of danger from conflagration. The oil over everything gathered up a lot of unnecessary dirt, making the use of the old grate bars an undesirable feature of oil burning equipment.

In the earliest attempts, the burner was placed at the rear of the fire box, the same as the burner of the G.T.R. oil burning motor car referred to earlier. The flame was directed forward under an arch, by which it was deflected backward and up into the flues. Except for light running, this proved an undesirable arrangement, as the draught would lift the flame over the arch and cause it to enter the flues without being completely consumed, and without a full utilization of the fire box heating surface area. The result was a dense black smoke at the stack, and a corresponding decrease in the amount of heat drawn from the oil from its incomplete combustion.

This unsatisfactory arrangement was replaced with a "flash hole" arrangement whereby a small hole in the grate, which was bricked over, provided a vertical draught to meet the spray of oil 1904 it was discovered that additional draught was required to completely consume the vapor. This was accomplished by admitting a draught of air through a hood in the fire box door, which mixed with the upwardly deflected spray, adding sufficient air when the spray was already partially consumed to complete the combustion. This arrangement constitutes what is called the horizontal draught system. Essentially, it is the system at present in use on a number of roads, but with slight variation to meet the individual ideas of the different designers. Since the day the horizontal draught was introduced, the development in oil burning equipment has been one of refinement rather than anything radically different in design.

of rennement rather than anything radically different in design. Coming more specifically to the C.P.R. practice, the equipment as installed on the company's locomotives, to the design of the mechanical department, based on the results of the findings of the motive power officials of the Southern Pacific Rd., will be described. In the first place, the oil burning equipment being applied to existing locomotives designed for the burning of coal,



Fig. 1. Piping Arrangement on C.P.R. Oil Burning Locomotives.

from the burner, which was still located in the same position at the rear of the fire box. The brick arch in the same location was likewise retained. The vertical draught striking the horizontal jet of spray at right angles gave very satisfactory results in the combustion of the oil. This arrangement prevailed until 1903.

In that year, the burner was changed in position from the rear to the front of the fire box, the flame being directed forward from under the arch, circling up at the rear of the fire box, and then forward through the flues, the flame striking all parts of the heating surface and at the same time being given a longer period in which to become completely consumed before passing into the flues. While this was an improvement on the then existing methods, there was still a great deal of difficulty experienced from incomplete combustion of the oil vapor when the locomotive was working hard, even with this longer path in which to burn. Various changes in the shape of the arch were tried with varying degrees of success, until finally in the idea borne in mind throughout was to change the construction of the locomotive as little as possible, but rather to adjust the oil burning details so as to work into the existing design. In consequence of this limitation on

In consequence of this limitation on the design being required to fit old locomotives, the oil storage reservoir is a separate tank so constructed as to fit into the coal space of the tender. Other reasons exist for such an arrangement, principal among these being the fact that if the tank were made integral with the water tank, the locomotive could not be employed off the division on which oil was the fuel employed. In addition, combining the two tanks makes it more difficult to undertake repairs. The tanks of the C.P.R. locomotives are built up of ¼ in. plate throughout, and are divided into eight communicating compartments. as in water tanks, with a central dividing wall and three cross walls, all of ¼ in. plate. The inside over all length is 13 ft. 3 ins., and wifth 9 ft. 5 ins., with a depth at front of 5 ft. 3 ins., and at the rear of 3 ft. 6 ins. The