pump have been slightly experimented with as a source of car heating; but the water carried in suspension is so large in amount and so difficult to get rid of, as to discourage any hope of success in that direction, in Canada, unless it be by the use of the Williams patent, recently experimented upon by the Central Vermont Railway, in which the old pipes employed in single circuit with a hot water heater are utilized. The single circuit is broken, and the pipes on each side of each car are connected under the platform by flexible hose, so that there is opportunity for complete circuit down one side of train and back the other, when the two hose under platform of last car are coupled together.

Exhaust steam from the locomotive, from the air-pump, or from the vacuum-pump, is admitted at forward end of this pipe circuit, and a vacuum-pump is attached at return end (also on locomotive). It is claimed that the vacuum-pump will clear the pipes of all vapour of water of condensation, however many convolutions or "pockets" there may be in the whole circuit.

Its main defect is its complete dependence on the locomotive (or other detached boiler) for heat, and its dependence on the pump to prevent failure by frost.

Mr. D. H. Neale, New York, writes (since the "advance proof" of this Paper was issued) "that a train heated by exhaust steam from the locomotive has been running between Glasgow and Aberdeen for the last two winters, with very satisfactory results, using a cast-iron radiator of a simple form under each seat. When the locomotive is first attached to the train line, steam is turned on until the coaches are warmed, after which a small portion of exhaust steam is found quite sufficient to keep up a comfortable temperature."

Stoves underneath the car frame have been used; but the supply of heat—with the hot air system—is not always adequate, and the gases of combustion are liable to get into the hot-air flues. With these defects, and a first cost about double that of a similarly equipped car with internal stove, the risk from fire is not removed, and cars so fitted have in accidents been destroyed by fire. External heaters for hot water or steam are more effective, but the fire risk is not removed—it is only in part lessened.

The Gold system is practically a storage, rather than a continuous heating system, and has been used only on suburban railways (900 cars). A 3¼-in wrought iron tube is almost filled with brine (water and salt), then sealed up, and laid horizontally within a 4-in. steam pipe, so that when steam is admitted into the annulus between the two tubes, it not only radiates externally but heats up the contained brine, thus charging a reservoir, which when steam is cut off continues the radiation by