

been wide open and the regulation done by the angle valve. They are not worth spending money upon in repairs, and when defective or leaking might better be removed and a piece of pipe put in instead.

Realizing at last that the necessary control could not be obtained in this manner, the multiple or split system was introduced, as outlined in Mr. Smart's paper. This arrangement consisted of two separate heating systems in the one car, each system having two pipes on each side of the car, and so arranged that one system could be shut off entirely and the heating surface in the car reduced one half. This was a very considerable advance in the control of the heating systems. This arrangement, however, had two steam inlet valves and two steam traps. To further simplify the arrangement this arrangement has been altered to one steam inlet valve and one steam trap. When it is desired to reduce the heat in the car a valve at the outlet of one of the steam jackets is closed, and the condensation collecting fills the steam portion of the jacket, preventing the entry of the steam. Reopening the valve, the water will escape by gravity and pass out at the steam trap. This arrangement prevents the possibility of one of the traps freezing if the steam valve leaked slightly when shut off, as occasionally occurred with the former arrangement.

This idea of heat regulation was carried even further by the use of two systems, each with two steam jackets, by which the two systems could be operated with all jackets working, or any desired number less. This arrangement accomplished a very considerable advance, but it required the location usually of two of the steam jackets under the car and two inside with a corresponding increase in the number of steam traps, steam inlet and blow-off valves, and the additional trouble necessary to maintain the equipment and increased difficulty of operation.

The regulation of the heat by altering the steam pressure supplied had proven a failure. The use of separate systems in the car operated independently, was a considerable gain; the further increase in the control, of being able to shut off one of the steam jackets on each system without shutting them entirely off, was even better. But for many reasons the application of either of these arrangements to old equipment meant the remodelling of the piping, and in some cases the change of the heater equipment in the cars.

However, a much more simple and effective arrangement was designed. It was recognized that the best means of controlling the temperature of the car was by varying the