

comparatively large heating surface of the steam jacket or coil and the relatively small volume of water. The steam bubbles which form exert an equal force in each direction, but the inertia of the column of water from the coil or steam jacket to the expansion drum, approximately 8 feet long, is much less than that of the column downward from the coil and through the pipes in the car and downflow pipe to the expansion drum, 250 feet or more in length. The water in the riser pipe is therefore easiest to move, and the steam bubbles which form displace an amount of water equal to their volume from the riser pipe into the expansion drum. The water in the riser pipe, now a mixture of steam and water, is lighter than the column of water in the downflow pipe; the difference in the weight of the two columns might be estimated at $1\frac{1}{2}$ pounds, although this will vary considerably. It is this force which sets the water in the radiator pipes in motion, and the motion will continue with lessening force until the steam bubbles have all escaped into the expansion drum, the water from the drum falling back into the circulation as required to replace the steam bubbles escaping. This movement of the water in the circulating pipes frequently becomes continuous when the return water comes back warm enough and the heat applied is great enough to cause a continuous formation of steam bubbles in the riser pipe.

It is evident that if steam must form in the riser pipe, the steam supplied must be slightly higher in temperature. But if there is any pressure upon the system due to the expansion of the water after the heater was filled or air pressure on the water, the boiling point of the water will be raised and the steam supplied will have to be hotter to cause circulation. The minimum steam pressure that will cause the water to circulate is usually from two to five pounds. The maximum steam pressure required at any time should not exceed fifteen pounds. Notwithstanding this, many absurd claims have been put forward by the various companies supplying the equipment for Pressure Reducing Valves or "Temperature Regulators," the following being a very good example: "This immensely valuable addition xxx completely solves the problem of temperature regulation. It is an automatic attachment which will positively maintain the required heat in every car, neither too much nor too little, but the exact amount necessary to warrant the greatest comfort." How unreliable such claims have proven we all are aware. These pressure regulators are practically useless for the purpose for which they were installed. Their normal position has