oned that the loss of efficiency in locomotive boilers was $750.00 per boiler per year. 1-16 inch scale reduces the efficiency of a boiler 15%, ⅛ inch, 30%. There is no doubt that what causes the low efficiency of a dirty boiler, is that the fire box scale will not conduct the heat to the water and in my opinion there is no doubt that that has a great deal to do with the breaking of staybolts on account of the enormous expansion which takes place in the fire box on account of the scale on the water side. They say that the greatest deposit of scale is found in the barrel of the boiler near the top checks and that a large amount of sediment leaves the water as soon as it enters the boiler. As you know the water on entering the boiler circulates along the bottom of barrel and then along the side water legs across the crown sheet and then to the front of the boiler. Now there is no doubt the first deposit is after it makes the first circulation. Just as long as the circulation keeps up, the deposits will be in the barrel of the boiler and not where the greatest evaporation is. There will be no deposits from water unless it is very bad until it is some time in use or until the water becomes thoroughly saturated with sediment and is unable to carry it along. We have no deposits of scale in our inspirator pipes. What causes them to clog up is the leaky top checks. The reason we find deposits around the mud ring is because the sediment in the water after making the circulation, is washed back around the barrel of the boiler and on to the mud ring.

Regarding boiler cleaners, every little while some person comes around with some boiler cleanser. I know an agent who was working down in the Eastern province with a boiler cleanser. He had occasion to go to a boiler user. He said he had a cleanser which would keep his boiler clean. They said they had no occasion to use such a cleanser as the water was so good, and their trouble was the tubes were too clean. The agent could do nothing there and he went away, but next morning he came back and said he had forgotten to tell them about an article which would put just the right amount of scale on the boiler tubes, and therefore they would get the desired results from their boilers.

The mechanical skimmer gives very good results. While the ingredients are held in suspension on top of the water, there is no question in my mind but that a great amount of impurities can be removed then. However this method is not considered a success. It seems to me that a good class of skimmers for locomotive boilers would save 20% in boiler efficiency. After this sediment is liberated from the water by the heat there is a great amount of it which could be removed. My locomotive experience has not been connected directly with the washing out of boilers.