Volume 22. Toronto, May 2, 1912

Contents of this issue on page 607

The Canadian Engineer

An Engineering Weekly

DISCHARGE CAPACITY OF SAFETY VALVES.

The February issue of The Journal of the American Society of Mechanical Engineers contains the results of some tests made upon Crosby safety valves by Prof. E. F. Miller, of the Massachusetts Institute of Technology.

The tests were made to determine the discharge capacities of 3-and 3½-in. locomotive pop safety valves, Fig. 1, at varying lifts under 200 lb. steam pressure and of corresponding sized inspector valves of the flat-seated and bevel-seated types, Figs. 2 and 3, under 100 and 150 lb. steam pressure. In each case the spring was released by a spindle and the valves were set a definite distance from their seats. In order to avoid unequal expansion, the metal of the valve body and that of the spindle were made the same in the case of the locomotive valves; and the difference in expansion was similarly obviated, as far as possible, in the inspector valves.

Connection was made to the boilers through a 5-in. line and all the discharge was condensed in a surface condenser and weighed.

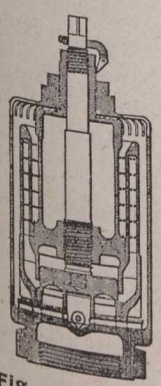

Fig. 1.—Muffled Locomotive Type.

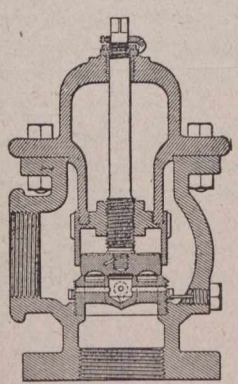

Fig. 2.—Flat-seat Inspector Type.

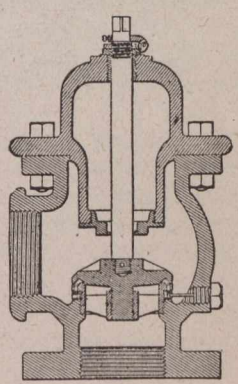

Fig. 3.—Bevel-seat Inspector Type.

The additional lift due to the yielding of the metal because of the presence of steam pressure on the under side of the valve was determined in each case by placing the valve in a testing machine and subjecting it to a load corresponding to the steam pressure, the movement of the valve with relation to its seat being measured by a micrometer caliper.

The results of the tests are plotted in Figs 4 and 5. As a result of these tests the muffled locomotive pop safety valve is now made as shown in Fig. 6.

In an addendum to Prof. Miller's paper, Mr. A. B. Carhart, of the Crosby Steam Gage & Valve Co., makes some general comments regarding pop safety valves. Quoting in part these remarks, he says:

"Pop safety valves were invented about 60 years ago and about 30 years later were perfected in this country and went into general use. Broadly, the invention consists of an addition to the disk of the valve so that when the valve is closed the addition is excluded from the action of the steam. However, when the valve opens the outflowing steam acts upon it and with the initial force causes the valve disk suddenly to rise higher and the spring to be compressed more than it would be with a force due to the steam pressure acting upon the original area only.

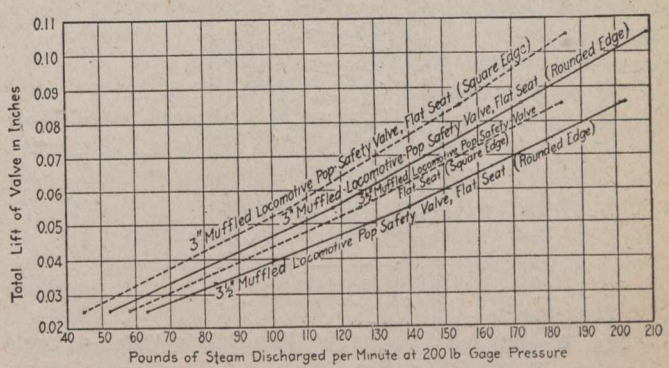

Fig. 4.—Results of Tests on Locomotive Type of Pop Safety Valve.

"The bevel-seated valves (Fig. 3) generally have this additional area at the periphery of the disk, outside of the seat, where it forms a chamber with a more or less contracted outlet at the extreme lip of the valve, through which all the steam must pass after escaping over the seat before it reaches the open air.

"As the seat is formed at an angle of 45 deg. to the vertical, the passage between the seat and the disk faces, when the valve opens, is diagonally upward, and what is called the lip of the valve is so related to this seat that the

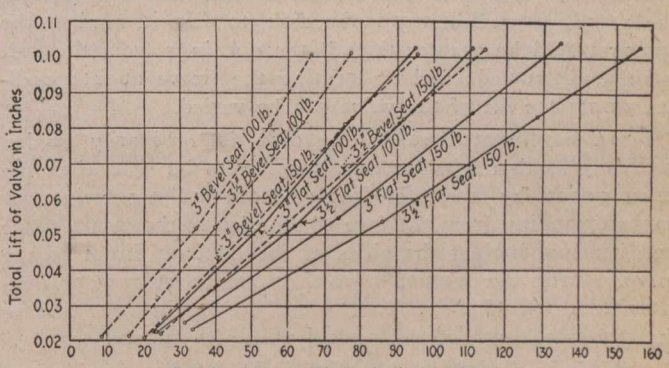

Fig. 5.—Results of Tests on Inspector Type of Pop Safety Valve.

steam is forced to impinge directly upon it before being deflected downward toward the bottom of the chamber where it reacts. The effect of the impact upon the lip of the valve is increased by the expansive force of the steam acting in the lip chamber on account of the partial and momentary