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Lubrication of High Pressure Slide and Piston Valve Locomotives.

By W. O. Taylor.

With the lubricant properly introduced and distributed with the steam, the pressure and temperature of the steam, are factors of but little, if any, importance.

It is within the memory of many who are in active service today, when vegetable and animal oils were the sole lubricants for valves and cylinders. The introduction of a mineral cylinder oil in 1870 met with derision by some, scepticism by many, and it was received in confidence but by few.

Of such superior merit, that long before its general introduction, a railway master mechanic made the statement in convention, that since its adoption as a substitute for tallow, the gain in power permitted the addition of one car to each train, it would have seemed an easy matter to induce the user of tallow to leave it for something better, but the change came about only through the persistent efforts of the manufacturer, and this statement applies to every user of steam, as well as to the railroads. How well has it been verified. "If we begin in certain- we shall end in doubt, but if we begin with doubts, and are patient in them, we shall end in certainties." It has long since been demonstrated that the best of animal oils will rapidly decompose, and their fatty acids corrode metal, and their gummy nature prove a source of danger as well as expense. That a viscous and cohesive mineral oil only, should be used in steam cylinders, and on hot rubbing surfaces, and that the price of an oil is of little importance in comparison with its friction reducing power.

Of the various terms which apply to all lubricating oils, gravity, viscosity, fire test, etc., explanation seems unnecessary; but as "flash-point" has become a byword with many since the use of steam of high temperature, it is pertinent to explain "flashing point" as the degree of temperature at which oils discharge vapor in sufficient quantity to mix with the air above the oil and produce a gas, which if brought in contact with a lighted match, or taper, will ignite and flash, hence "flashing point." The writer has witnessed a 550 degree test oil, passed through a cylinder in steam superheated to 1,000 degrees, and from the water of condensation recovered in its original condition. This test was in the laboratory, but it demonstrated that when protected by the steam the oil stood an excessive temperature, and that phenomenon of flashing does not, and cannot occur while the oil is in the steam.

The function of a lubricant is to keep

the rubbing surfaces apart; the determining quality of a lubricant is its ability to satisfactorily perform that function. The essential quality required is that of distribution over the surfaces to be lubricated. The best service from a valve or cylinder oil requires that it enter the steam chest thoroughly atomized, each drop being divided into thousands of minute drops, or atoms, as it reaches the rubbing surfaces. This is accomplished by a combination process of emulsification, vaporization, and atomization, and it follows that a first class cylinder oil must possess the qualities to readily em-

to this type of valve pertains to its use with saturated steam. With piston valves, where a very high initial pressure is used, or where superheated steam is used, which, because of a greater expansive force throughout the stroke, maintains a higher average pressure, even though the initial pressure may not be so high, the design of rings should be such as to avoid an excessive pressure behind them, forcing them against the walls of the valve chamber, which results in a loss of energy, and excessive wear of the rings. It has been found that when using steam at high temperatures the composition of the rings in both valves and cylinders is an important factor. A hard gray iron has given excellent results.

One of the world's great thinkers has said, "Men seek for truth in their own little world, and not in the great world about them." The average mind is prone to follow in the well beaten paths of the pioneers who blazed the trail. Precedent is the most available guide. It is only the restless spirit of the discoverer, or changed conditions that stimulate a new thought. The evolution of the locomotive has carried with it the progress from the earlier method of delivering the lubricant through the medium of a plug cup, located on top of the steam chest, to the more convenient location in the cab. The automatic displacement cup, located on top of the chest, has been superseded by the hydrostatic or mechanically operated lubricators, but it seems that because, in the infancy of the locomotive, from the top of the steam chest was the logical place to admit the lubricant, precedent rules that the old custom shall prevail, and at present, on a large percentage of locomotives in this country, the oil for valve and cylinder lubrication is delivered direct to the steam chest or valve chamber. "An obstinate adherence to custom, is as turbulent a thing as innovation." Is there a good reason for continuance of this practice, other than convenience, custom or precedent?

With the increase in steam pressure came the locomotives of increased valve and cylinder dimensions, a revolution in train service, and runs scheduled at higher speeds for long continued distances without closing of throttle. A new problem was presented. Precedent offered no solution. The revival of an old question, familiar to those who have seen the transition from tallow to mineral oil, the adaptability of the oil for the service, became a subject of discussion, and "flash point" was freely handled by many who have never given it thought before. Some not even knowing its significance. "Those who take in but few considerations easily decide." The lubricator and the oil manufacturers were placed on the defensive. In



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ulsify and atomize, with a sufficient degree of vaporization to spread itself over the surfaces with the steam. In other words, to lubricate the steam..

Uniformity of distribution is as important as uniformity and continuity of supply. These are principles that apply to valve and cylinder lubrication, irrespective of type of valve or temperature of steam. The design of valve, the method of introducing the oil, are very important factors. It has been practically demonstrated that a flat or slide valve cannot be successfully used with very high temperature steam because of the heat warping the valve, presenting an uneven surface to the seat. Reference