

the minds of many there must be a different device for delivering the oil, and a better oil. The manufacturers of the hydrostatic feed lubricator, without any deviation from the principle upon which that device is operated, promptly met the requirements, by changes in construction, strengthening and increasing areas. In the vernacular of the day, the manufacturers of the oil "stood pat." They had builded upon solid foundation, and for the future. Through all the changes incident to the growth, from the 20 ton locomotives of years ago, to the mammoths of the present, through all the gradations of temperature, as steam pressures have increased from 120 to 230 lbs., and the higher temperatures incident to superheating steam, the oil has stood the test, and without one iota of change in composition or characteristic, the same oil that superseded tallow in 1870, has rendered, is rendering, and will continue to render satisfactory service, when properly delivered and distributed on the surfaces where needed.

It has been stated, that with the lubricant properly introduced and distributed with the steam, the pressure and temperature of the steam are factors worthy of but little consideration. The best authorities are agreed, that the ideal method of lubricating steam surfaces is by having the oil introduced in a highly attenuated form, and thoroughly intermingled with the steam, the steam becoming lubricated. Then why not deliver the oil into the steam, at a point where this process can take place before it reaches the steam chest or valve chamber, and thus secure lubrication at every point where the steam has contact? Those who have had to do with the examination of slide valves, have been impressed with the conditions found. All too frequently the valves and seat cut or excessively worn, and yet the top of the pressure plate always oily, a convincing refutation of the claim sometimes made, that the heat dries the oil, and a proof that while it has been delivered, it has not been satisfactorily distributed. Such conditions have prompted a change in the delivering point from the top of the chest, to the steam way in the saddle casting, and personal observations in several instances, justifies the assertion that better results were obtained than were possible under the old method. The kindness of a friend, who is thoroughly familiar with the subject, has made it possible to submit information pertaining to the device shown in one of the accompanying illustrations which has given excellent results, and is confirmatory of the writer's opinion as to the best place to admit the oil to the steam.

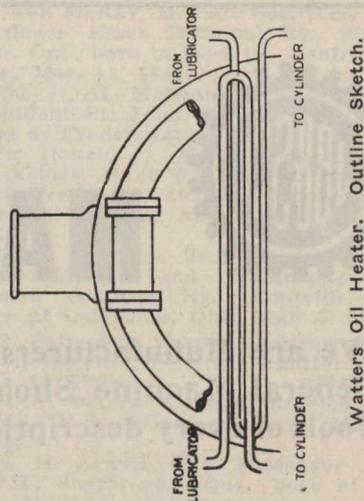
In a letter which accompanied the blue print, my friend wrote: "The drawing is from the original atomizer made, which idea was conceived and put into operation by J. C. Garden, Master Me-

chanic, G.T.R. on some passenger locomotives, cylinder dimensions 20x26, with steam pressure 225 lbs., equipped with Richardson slide valves, which were giving much trouble from valve seats cutting, notwithstanding engineers were receiving all the valve oil they desired. One engine in particular had valve seats faced four times in 2,000 miles made. The oil delivery pipes were then turned into the saddle to steam passages, and the valves examined after the engine had made 30,000 miles, and the seats were perfect. As an experiment, by putting a valve in delivery pipe, close to lubricator, and turning the pipe down a distance of 12 ins, and up again to the original position, and putting in another valve; after filling the bend in pipe with water, and working steam for some time opening the valve next to the steam chest, it was found that the water had been entirely drawn out of the 12 in. pocket. Mercury was also raised 3 in. in it proving that the atomizer is really a syphon to the delivery pipe. I am quite positive in assuring you that the locomotive is better lubricated by the use of this device, than with the ordinary couplings and plugs."

Recently, in reading, I noted a thought which seems applicable here: "Things authorized by custom, if not excellent, are yet comfortable, and sort well together." And again, "With regard to what is common; let men reflect, that they have hitherto been used to do nothing but refer and adapt the causes of things of rare occurrence, to those of things which more frequently happen, without any investigation of the causes of the latter, taking them for granted and admitted." For years, the custom of delivering the oil to the steam chest, "if not excellent" has been "comfortable," convenient.

Twenty years ago, a cut valve was of rare occurrence, and always attributed to neglect. Now the "things which more frequently happen" are attributed to the same cause often without investigation. Not long since I learned of a device originating with J. H. Watters, Assistant Master Mechanic, Georgia Rd., by means of which after the oil leaves the lubricator it is passed through superheating pipes located in the front of the engine, by means of which the oil is raised in temperature to that above the temperature of the steam, and is carried with the steam to the surfaces to be lubricated. I am informed that this device was tried on a passenger engine, with cylinder dimensions, 18x24, wheel diameter, 60 ins., steam pressure 160 lbs., running in local passenger service 192 miles a day. This locomotive made 530 miles to one pint of valve oil, including the lubrication of the air pump. The illustration and information is submitted as a further confirmation of the statement that the efficiency of the oil is not impaired when submitted to high temperatures, and also as another means of obtaining satisfactory lubrication, by introducing the oil into the steam at a temperature above the steam, thus insuring more perfect atomization and distribution. While the locomotive upon which this test was made is not the equal in size or steam pressure, of the modern locomotives, the principle involved is the same, and results should be comparatively as good on the larger locomotives.

In the earlier experience with superheated steam, it was assumed that a mechanically operated, or force feed lubricator, was necessary. The error of that opinion is shown by the success attained from the hydrostatic feed lubricator, which is the standard in this country for superheated steam, as well as locomotives using saturated steam. It has been demonstrated beyond question, that the cylinder oil in general use, is efficient under all steam pressures and tempera-

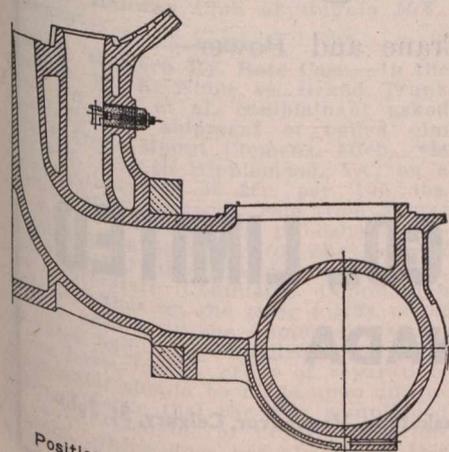


Watters Oil Heater. Outline Sketch.

tures yet obtained in locomotive operation. It has been further demonstrated, that locomotives using superheated steam, where the maximum temperature does not exceed 500 degrees Fahr., do not require any more oil for valve and cylinder lubrication than the same locomotive using saturated steam. I will go further and say that even less oil is required for the locomotive using superheated steam. Conditions are more favorable for satisfactory and economical lubrication. The absolutely dry condition of superheated steam entirely obviates the flushing of valves and cylinders with the consequent washing away of the lubricant, which is a frequent cause of loss of material, and impaired efficiency of the locomotive, when using saturated steam. The pressure in the steam chest is necessarily lower than the boiler pressure, insuring a more uniform delivery of the oil when fed directly to the valve chamber. The oil is more thoroughly atomized when it comes in contact with the high temperature steam and is consequently better distributed over all parts to be lubricated. When brought in contact with these parts, because of their lower temperature, the oil condenses and remains because of the absence of moisture.

The statement has been made, and reiterated, that the valve oil now in general use is efficient under all pressures and temperatures. Without equivocation that statement is correct. However, the manufacturers, realizing the importance of furnishing their patrons the best that can be produced, are now furnishing an oil specially adapted for service in steam temperatures above 500 degrees, because of its high viscosity, cohesion, and vaporization in such temperatures. In the terms we all understand, under those extreme temperatures this oil adheres more closely to the walls of the cylinders, and to the valve seats, than does the oil we are more familiar with, and consequently it requires a smaller quantity.

A committee upon the lubrication of locomotives using superheated steam, recently reported in part as follows: "From what the committee has been able to learn, the highest temperature of steam obtainable under present conditions, does not exceed 620 degrees Fahr., and of course, this temperature does not prevail in the cylinders, but only in the steam chest; inasmuch as the temperature in the cylinders is governed by the average pressure obtained throughout the stroke of the piston, and not the initial or admission pressure. It is believed by the committee that two locomotives, the same in every respect, except one being equipped with high temperature superheat, the one with superheater will make as many miles per pint with superheat valve oil, as engine with-



Position of atomizer for main valves.