

## USE AND BENEFITS OF PRESSURE RECORDING GAUGES.\*

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**R**ECORDING gauges for keeping a permanent record of steam and water pressures and vacuum have been used by waterworks for many years. In 1891 Mr. Charles A. Hague, in his introduction of his valuable paper entitled "Value of Pressure Records in Connection with Waterworks," said that we should know what is going on inside of steam and water pipes, just the same as we have found out what is going on inside the steam cylinder by the use of the indicator.

In his paper Mr. Hague quotes Mr. Edwin Darling in his 1889 report of the Pawtucket, Rhode Island, waterworks, as follows: "No well-conducted waterworks can afford to be without recording gauges, and, when properly located, they will, in my opinion, pay for themselves within one year" (Proceedings Am. W. W. A., Philadelphia, 1891, p. 77).

These extracts go to show that the value and usefulness of recording gauges were fully recognized more than twenty years ago. We certainly do need to know what is going on inside of the steam and water pipes under our charge, and at all times. A look at the non-recording gauge shows us the pressure at that time, but is no proof or indication of what it was a minute before. The recording gauge does give this information; it tells what the pressure was at any time, day or night, and on any date. It is a constant watchman, just as a water meter is a constant inspector. It keeps a complete and indisputable record of pressure at all times.

**In the Pumping Station.**—A recording gauge on the steam line is the best possible check on the work of the fireman and engineer. If pumping to a reservoir, under a constant load, the uniformity of the pressure line tells how uniformly the fires are being tended and the feed water applied. An absolutely even line would indicate perfection in the fire room, a ragged line, inattention on the part of the fireman. With properly kept boiler room records, the fireman's work can be accurately checked. A sudden drop in the pressure line should correspond exactly with the record of fires cleaned or boilers blown off. A quick drop or sudden rise at any other time indicates improper firing.

With a direct pumping system, or where pressure has to be raised for fires, a less even steam line is to be expected; but a comparison of the steam and water charts will show how quickly the boiler responds to a sudden demand for more water pressure, by restoring and holding the pressure when the work of the pumping engine is suddenly increased. A direct pressure pumping system requires greater care and alertness on the part of the engineer and fireman, and the recording gauges are the best possible means of knowing how well they perform their work. Perfection would mean a line equal to one drawn with a compass or straight edge, according to the style of chart used, and the nearest approach to this indicates the best work. A ragged, zigzag line means inattention and carelessness, or something wrong with the boilers, steam lines, engines or pumps. It rests with the chief engineer or superintendent to find out which is at fault, and to correct the fault: the gauges cannot do this, they can only tell in positive language that something is wrong.

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The presence of recording gauges is an incentive and stimulus to the men to do better work. They know that they are constantly watched; that a constant and indisputable record is being made of their work. The superintendent, when he visits the pumping station, or when the gauge chart is placed on his desk, has a perfect check on the work of the pumping plant force, and a record he can preserve for all time. When he has occasion to call an engineer or fireman to account for laxness, he has before him, to confront the culprit with, an undeniable record of his work. A poor pressure line may not be the fault of the engineer or fireman; it may be due to poor fuel, a leaky or sagging steam line, bad feed water, poor draft, or engine trouble; but the engineer is just as much at fault, for not promptly recording and reporting such troubles, as he would be for neglecting his work, or not keeping the fireman up to his part of it.

If good pressure charts are obtained for a while, but constantly and uniformly get bad, it indicates either that the plant is wearing out or being overloaded. If both good steam and water charts are obtained when the plant is pumping, say, 5,000,000 gallons a day, and grow more and more ragged as the pumpage is increased, they surely indicate that the pumps or boilers, or both, are being worked beyond their economic capacity. If the pressure lines grow in irregularity, when there is no increase in the work, they indicate that some part of the plant is wearing out or is in bad order, and needs overhauling.

Steady lines of the steam charts indicate uniform and careful firing, and a steam plant in good condition. Ragged gauge lines indicate either poor and irregular firing or bad condition of the boilers. If the feed water is a scale-forming water, the poor gauge lines bear out the evidence of the coal scales, that the boilers need cleaning.

A fireman cannot fill his firebox, then light his pipe and go out of the fire room to seek a cool place, and maintain an even line on his steam gauge charts; but must stay by his fires, fire frequently and lightly, and keep clean fires. Knowing how completely he is on record he will be careful, and will also keep a record of everything that might affect his record, such as poor fuel, time of cleaning fires, blowing off boilers, etc. The latter records, which might otherwise be neglected, are in themselves of sufficient value to more than pay the cost of the recording gauges, if no other benefits were obtained.

The vacuum gauges should also be recording, to indicate the condition of the engines and pumps, a falling off in the height of the vacuum line indicating leaks that mean more coal. The lines on the vacuum gauge charts should not vary much. If a vacuum of 27 can be obtained one month or year, it should be maintained the next month and year. If a higher vacuum is maintained with one kind of packing than with others, the one holding the high vacuum is the best, and probably the cheapest, though much higher priced than the others. The difference in cost might be made up many times in the saving of fuel.

No engine room is complete without at least three recording gauges, as the operation of the plant cannot be properly checked and governed without them. They also insure better work on the part of the operatives.

Many times the recording gauges create a spirit of rivalry between men on different shifts, through an effort on the part of each shift to do better than the others, to show more even lines on the charts; thus causing all to do better and more economical work.

There should be a certain economical relation between the steam pressure and the water pressure. When this is