OUT OF ORDER INDICATOR FOR AUTOMATIC BLOCK SIGNALS.*

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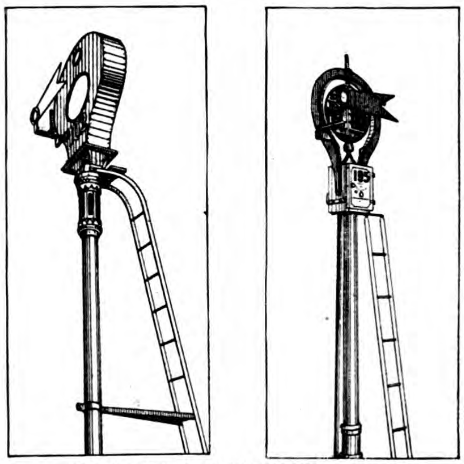
Considerable dissatisfaction has arisen with the ordinary way of showing that a signal was out of service, by hanging a green disc over the number, which was liable to be blown off in a very high wind, and the difficulty has led to very crude devices by the maintainers when the regular disc was lost, damaged or too far away to go after, such as tying on of any old piece of gunny sack or fabric of any kind they could get hold of which was large enough to cover the number. The greatest disadvantage of the whole matter is that it is impossible to get a night indication out of such devices.

Walter Gravit, the assistant master carpenter of the Lake Shore road at Elkhart, devised a small fish-tail blade so attached as to hide the number and permit the use of the regular single lamp to give a corresponding night indication. This was later shifted to stand full in front of the regular signal disc, so that there should be no change in the location of the indication, and also the number was left exposed, enabling the engineer to see the number and not depend on his memory for it, if it was necessary to make any report on the signal in question. The blade with its glass and bracket is all one piece and can be easily placed in the small socket which is permanently placed on each signal. Each maintainer is supplied with one or more of these blades, according to the number of signals he is caring for, and can very easily take one along when going to a signal that has been reported defective, or should his territory be large it could be kept in the section house nearest to the signal, and the section foreman be instructed to apply it as soon as the signal went wrong, thus avoiding full service stops at a signal out of order between the time it first goes wrong and the time when it is possible for the maintainer to get to it. There is really nothing more to be said about this device, the engraving accompanying making the details perfectly clear. The cost of these indicators complete is about $4.75 each.



OUT OF ORDER INDICATOR FOR SIGNALS.

*Paper presented at a meeting of the Railway Signaling Club, Chicago, on May 15, 1901.

The Hayden Feed Water Purifier.

In the course of the numerous considerations given to the matter of feed water purification by the Master Mechanics' Association it has been suggested that distillation by plants located in connection with the water tanks would afford the necessary relief from hard waters. The expense of the installation and maintenance of such plants has, however, been such as to be practically prohibitive except in extreme cases. The device herein described is intended to meet this demand, and to afford the means for purification within such limits as to enable the apparatus to be applied to locomotive boilers without interference with the duties of the engineman. The device works upon the principle that carbonates when heated to 212 degrees F. are no longer held in solution, and sulphate of lime becomes less soluble with the higher temperatures. Sulphate of magnesium begins to dissociate at a temperature of 212 degrees F., and is probably entirely broken down at a temperature of 270 degrees F. In view of these facts, what is necessary to secure pure feed water is a device which will first secure a temperature of at least 270 degrees F., and second, which will remove the impurities held suspended in the water and prevent the sulphuric acid arising from dissociation of magnesium sulphate from corroding the boiler.

The necessities of a device for this purpose are that the machine shall be capable of purifying a large volume of water in a short space of time, and that the appliance be compact and simple in operation. The dimensions of the device in question are 40 inches in length by 19 inches in diameter, and it is therefore applicable to the locomotive without obstructing the running board or the view from the cab.

The requisite temperature for the process is secured by means of a live steam heater located in a delivery pipe between the injector and the purifier and taking steam from the boiler. A feed water temperature of 275 degrees or over is thus insured, and the live steam is restored to the boiler without other loss than that of radiation. It is claimed that this is compensated for by the improved circulation due to the high temperature of the feed water delivered.

After leaving the heater the water passes to the purifier, entering a lower chamber thereof in such a way as to impart a centrifugal motion to the water contained therein. Suspended matter is here entrapped and blown off by surface or sediment blow-off cocks, according to the specific gravity of the matter. The purest water is in the middle of the chamber and from this point it is passed through a filter chamber with 20 inches of filtering material, which removes not only the scale-forming elements but the mud as well. The collected sediment is removed at intervals by flushing, a simple arrangement of two valves being sufficient to operate the blow-offs and flush the machine.

The device is made wholly of bronze metal and barring accidents should last forever. The attention required is an occasional flushing, which can be done by the fireman without interference with his ordinary duties. The cost of maintenance is said to be limited to a renewal of the filter gravel once a month. The device is furnished by the Hayden Feed Water Purifier & Heater Company, Columbus, O.

Harbor Improvements at Chicago.

In removing the obstructions to navigation and the flow of water through the Chicago River, the trustees of the Sanitary District of Chicago, who have this problem in charge, are pushing their work vigorously and as rapidly as the many obstacles to be overcome will permit. The first and probably the most important part of the work consists in the ultimate removal of the center-pier swing bridges. The swing bridge at Taylor street has been entirely removed and replaced by a Scherzer rolling lift bridge, recently completed. The specially obstructive railroad bridge which is near the Taylor street bridge will be removed within a few months, as the new double-track rolling lift bridge of 275 feet movable span will soon be completed and placed in service. Contracts have been awarded and work has commenced upon the new Scherzer bridges replacing the swing bridges at Canal and Main streets. Bids are advertised to be submitted on May 8, 1901, for a Scherzer bridge to replace the swing bridge at Randolph street.

The Scherzer Rolling Lift Bridge Company, Chicago, have also recently completed plans for a new bridge at State street, to replace the present swing bridge, which was extremely obstructive to navigation on account of a sharp bend in the channel of the river at the site of this bridge. The new bridge will give a clear, unobstructed channel for navigation 140 feet wide; the movable span, center to center of bearings, will be 161 feet 8 inches; the roadways, center to center of trusses, will be 40 feet 6 inches wide, with two sidewalks, each 11 feet wide. As State street is the principal retail business street of the city of Chicago, and the bridge is near the business center, it was decided to make the outlines of the new bridge as artistic as possible without increasing the present cost of the structure. The bottom chord is arched and the top chord projects but slightly above the roadway, thus giving a deck bridge with an unobstructed view. The new bridge when completed will not only facilitate navigation, but will present a striking contrast to the present unsightly swing bridge. The bridge without extra cost for ornamentation will be in harmony with the growing demand for more artistic bridge structures at Chicago. The bridge is so designed that appropriate ornamentation may be added at any time in the future, when funds are available for such purpose.

Plans have also been completed for new rolling lift bridges, to replace the swing bridges at Harrison street and Eighteenth street, and within a few weeks the Scherzer Company will have completed plans for a new bridge to replace the swing bridge at Polk street. All of the above new bridges will give an unobstructed channel of 140 feet in width, or wide enough to pass side by side two of the largest lake or ocean vessels likely to enter the harbor of Chicago for many years to come. The wide channels provided will enable vessels to pass these bridges very rapidly, and time will also be saved, as all bridges are designed to be operated by electricity, and may be opened or closed within 30 seconds.

As soon as these bridges are completed and placed in service, the work of removing the other obstructive swing bridges can be proceeded with without unduly obstructing the street traffic across the bridges. After all the swing bridges have been removed and replaced by the more modern type of bascule bridge, and the obstructive tunnels have been lowered or removed, the largest lake vessels can readily and rapidly reach any point along the 56 miles of dock frontage comprising the present internal harbor of Chicago, and the delays heretofore caused by the slow passage of the vessels through the narrow openings provided by the old swing bridges will be obviated. The highway traffic will also be greatly facilitated, as the present comparatively small and frequent vessels will be replaced by larger vessels, less frequent but carrying a larger tonnage. The comprehensive plan under which the harbor improvements at Chicago are now being executed indicates that Chicago will not only retain all of its present large marine commerce, but that it will also be prepared for the larger vessels and great increase of marine commerce certain to follow the completion of an adequate ship waterway within the United States, either to the Gulf of Mexico or to the Atlantic Ocean.

THE LIGHTING OF RAILWAY CARS.*

GEO. D. SHEPARDSON.

In the well-appointed passenger trains of to-day, traveling is a pleasure as compared with the tedious journeys of a few decades since. The railways are on the alert to meet the requirements of a discriminating public, not only caring for their safe and prompt transportation, but also catering to their demands for comfort and even luxury. A large part of travel must be done during hours of artificial lighting, especially by business men, who constitute the majority of passengers and who wish to do their traveling as much as possible outside business hours. The problem of securing satisfactory light in the cars is therefore one of considerable importance.

As early as 1856, experiments were made on the Chicago & Galena Railway with the use of compressed city gas for car lighting. Coal gas loses much of its illuminating power when compressed, and has therefore been practically abandoned for train use. In 1867, Julius Pintsch, of Berlin, began experimenting with various gases, and found that gas made by heating oil to a high temperature would stand compression with little loss of illuminating power. He succeeded in building up a business of great magnitude. During the last few years, acetylene gas made from calcium carbide, a product of the electric furnace, has been applied to car lighting with more or less success. Incandescent electric lamps were first used for train lighting in 1881, and are now used in many of the best trains in all countries.

Each of the old methods of car lighting has certain features which are objectionable to the traveling public, to railway men, or to both. The first requirements in any satisfactory method is safety. The devices for burning oil and gas have been brought to a high stage of progress. Yet, with any illuminant requiring a flame, there is at least a possibility of fire risk. In the case of gas, there is the added possibility that pipes may become broken and allow the gas to escape and mingle with the air, until an explosive mixture is formed. The results of the explosion of such a mixture would not be pleasant to contemplate.

The worst features of oil and gas are the products of combustion. Oil and gas lights not only cause a large amount of heat, which adds to the discomfort of summer travel, but they use up the oxygen of the air faster than do the passengers. The products of combustion are generally carbonic acid gas, water vapor and heat. When the lights do not burn properly, they may give off more or less of a poisonous gas known as carbon monoxide. The presence of the carbonic acid gas and of the water vapor has a tendency to make a person feel drowsy and dull. The water vapor adds to the discomfort by reducing the evaporation from the skin. A large part of the waste from the body is eliminated through the skin by insensible perspiration, the evaporation of which cools the body. As the air becomes saturated with water vapor, evaporation from the body diminishes and one soon becomes hot, drowsy and uncomfortable. The principal function of the fan is not so much to cool the air as to blow fresh air upon a person, and so increase the evaporation from the body and thereby indirectly cool it. The electric fan in dining and parlor cars is a grateful luxury as it causes the air to circulate, even though it be warm, and thus continually brings near the skin air that is less fully saturated with moisture.

The degree of emphasis to be placed upon this consideration may be inferred from a few figures. For illuminating various kinds of American passenger cars, the light varies from the equivalent of that given by about forty candles to that given by 1,200 or 1,500 candles. The ordinary car has an illumination equal to that of about 170 candles. The consumption of oxygen and the products of combustion in the lamps giving that amount of light may be compared directly with the presence of a number of passengers, the candles being equal to about 115 adults, oil lamps being equal to about 80 adults and gas being equal probably to about 25 adults. The above comparison makes no allowance for the additional discomfort of dirty lamps, which smoke and smell.

A great objection to the oil lamp is its liability to smoke; and another is its liability to leak oil on the carpets and upon the clothes or baggage of passengers. It was stated, several years ago, that it was costing the Pullman Company about $200,000 annually to replace carpets and other furnishings injured by oil lamps; no record being available, however, of the damage to the property of passengers.

When the incandescent electric lamp approached a commercial form, in 1879, its advantages were quickly recognized. Experiments looking toward its use on railway cars were begun almost before the first central station for stationary lighting was in operation. In spite of the frailties of the early lamp and the limited sources of electricity then available, the London Brighton and South Coast Railway in England began in November, 1881, to operate electrically lighted trains, and has continued this method of illumination until the present time, making improvements from time to time as experience dictated. Soon after this trial began, other roads, in nearly every country, followed; and to-day the number of cars lighted by electricity runs up into the tens of thousands, not counting the myriads of trolley cars which are lighted and propelled from the same source of power. A history of the development of electric lighting for railway cars would make an interesting study for railway officials and others who desire to keep fully posted in this branch of electrical work.

Power for operating the electric lamps and other devices may be obtained from storage batteries carried underneath the car, from dynamos, or from a combination of the two. The storage battery consists of a number of lead plates immersed in diluted sulphuric acid. When a current is sent through the battery from an outside source, certain chemical changes take place, which make the plates electrically different; so that when the circuit is provided they will cause a current to flow through. There is no storage of electricity as such, the energy of the charging current being changed into chemical energy, which is stored and later is re-transformed into electrical energy.

The dynamo, often called an electrical generator or a dynamo electric machine, is a device for changing mechanical energy into electrical energy; it is based upon the interrelations of electricity and magnetism. For train lighting, the dynamo is driven by a steam engine in the baggage car, or it is belted to the axle. For the engine-driven dynamo, steam is obtained from the locomotive, and provision must be made for supplying light when the locomotive is changed at division points. There is likely to be some vibration from the engine throughout the train, which, however, is noticeable only when the train is standing still.

With the axle system, provision must be made for lighting the train when standing and also when running at too low speed for the dynamo to operate. The storage battery furnishes the simplest means for supplying light at such times; suitable devices being arranged to transfer the lights from dynamo to battery or vice versa, as required. In connection with the axle-driven dynamos, the batteries are charged from the dynamo on the car, either while the lamps are lighted, or during the day, or at both times. Batteries used as auxiliaries to engine-driven dynamos are charged either en route or at the terminals, while the train is being cleaned and inspected for the next trip. Batteries used for lighting without any dynamo on the train must be charged at the terminals of the road.

The choice of an electric lighting system best adapted to a given train or to a given road involves a number of technical considerations which require careful investigation. It may be said in general, however, that the storage battery without any dynamo on the train is suitable for trains which are not more than one day away from a source of charging current; that the system of engine with dynamo in the baggage car is suitable for solid trains going through to their destination, without any changes in makeup; and that the axle-lighting system finds a field almost its own in the case of through trains on runs several thousand miles long, and on trains which are split up by having cars added or removed en route, while it can compete in point of economy and good service on trains for which the other systems are suitable.

Comparing the different sources of light, passengers prefer gas to oil, and electricity to gas, provided the electric lights are properly taken care of and are reliable. Since experiments with electric lights on trains have been made from the time when the electrical art was in an early stage of development, it is not surprising that some of the early attempts were not as conspicuously successful as they were expensive. The compressed gas system was brought to a reliable and commercially successful stage ten years before the electric incandescent lamp was ready, and the gas interests made good use of their opportunity to preempt the field. After much expensive development, and in the face of many discouragements, the advocates of electric lights for train use have overcome nearly all obstacles; and to-day the electric light is recognized as the only thing for the best service. The modern apparatus is developed to such a state of reliability and perfection that it is now possible for the railways to purchase electric lighting outfits, or to secure them on a rental basis at moderate cost and guaranteed by ample capital. Now that the electric light has won its standing with the railways, the public may expect a rapid adoption of this admirable source of light and ventilation.

*From the Forum for May 1 01.

The Order of Railway Conductors is holding its biennial convention at Saint Paul, Minn., this week.