

there is a large reduction in the number of parts used for drawbar attachments, and consequently a decreased first cost. The number of pieces removed will vary somewhat with the design, but will average about 20, including bolts and nuts.

It has been argued that it will cost more to remove and replace a broken centre sill than a draft timber. This is true, but it has not been found that the centre sills in this type of car give trouble from breaking, for the sufficiently good reason that they are subjected principally to blows upon their ends, these blows being transmitted directly through one integral piece to the next car, whereas the draft timbers have to resist a transverse breaking strain, and the end blows are transmitted through bolts and inferior key connections to the centre sills, the evil of which has recently been better appreciated, and it is now common to find oak filling pieces of considerable size between the ends of the draft timbers, placed longitudinally under the centre sills. This in reality is a sub-sill without the advantages of such a sill, and its presence is sufficient proof of the lack of security and durability to be had with the draft timbers of the common form.

This is a subject on which we shall have more to say shortly, as we are expecting some statistics from service, and we refer our readers who are interested in the matter to the discussion by Mr. Rhodes and others before the Western Railroad Club at its last meeting, the substance of which appears in this issue.

Colored vs. "White" Lights for All-Clear Signals.

Certain operations in railroading, familiar to all, are regularly carried on under circumstances necessitating considerable risk, and in spite of those circumstances, because the danger has become a familiar one, because it is small, or for other reasons. A familiar example is the use of ordinary instead of colored lights for indicating to an engine runner at night that the track in front of him is clear. Every one knows that a street lamp or a light from some other wrongful source is likely some time to tell an engine man that the track is clear when it is not, but any anxiety felt concerning this danger is so mitigated by the feeling that the danger is remote that not much is heard of it. Still the question receives notice here and there, and it is to call attention to some of its aspects that we now speak of it. One of our best signal engineers recently advocated the use of green for all-clear signals, and a prominent Western road has put in several interlocking plants in which the semaphore arms are so made as to always show a colored glass in front of the lamps, green for all clear and red for stop. The Boston & Albany, whose semaphores are fitted with three lamps each, so as to give position signals at night, uses green lights for the all clear position, and has done this for several years, so that the use of green for safety cannot be regarded as an untried experiment.

If the circumstances are correctly given, a derailment on the Chicago & West Michigan, reported in our November accident record, printed last week, must lead the officers of that road to take a lively interest in this question. An officers' car was derailed at a derailing switch, and several of the occupants injured, by reason of the breakage or displacement of a red glass in a signal lamp, whereby the flame appeared to the engine man in its natural color, thus indicating safety, while in fact the position of the signal was danger. A snowstorm was raging at the time. A few more mishaps of this kind would very quickly bring the color question to the front; but the part of wisdom is, of course, to consider all questions according to their intrinsic importance, and not be guided by mere temporary prominence. In addition to the possibility of engineers mistakenly reading an all-right signal from fishermen's lanterns or from lights placed in the window for lovers by romantic maidens, we see here the liability that danger may come from failure of the signals themselves as well as from mistakes of engineers.

The claims and arguments for the use of white are familiar. White is consistent with the day signal for all clear, and that has been used so long and is so satisfactory that no one thinks of changing it. Every one rests on the assumption that there are only two colors available, and that one of these (red) is needed to indicate danger, and the other (green) to indicate caution. During the past few years the most familiar answer to complaints about signal lights has been the argument for the illuminated semaphore, and it is not to be denied that this device has made encouraging progress; but in view of the increased cost of the additional element, in view also of the features in which illuminated blades are still to be perfected, and the inclination of many managers to stick to lamp signals, simply because they are old and well tried, it is cer-

tainly well to take all reasonable means to make them satisfactory. There is no ground for assuming that the present plans of using lamps and colored lenses are the most perfect possible.

In the nature of things the possibility of a collision by reason of the breakage of a glass is somewhat remote, for an operator seeing a train pass a signal which he knows is at danger would often have some chance of stopping the train by a hand signal. The engine man would also have, in fair weather, the chance of seeing, by the aid of his headlight, the position of the day signal, whether arm or disc. If an engineer sees a street lamp (or any other white light) and in consequence runs past a signal which actually shows a red light against him he will, in many cases, be found to have neglected precautions that were plainly necessary, and it is therefore fair to put the blame wholly upon him; but this does not fully answer the excuse that he can fairly make when a street lamp takes the place, in his vision, of a switch or block signal lamp which has become suddenly extinguished by accidental causes, and in any event the true desideratum is a system which shall not only work well practically, but be satisfactory theoretically. In signal lights, as in train dispatching rules, construction of locomotives and numerous other things, all intelligent officers strive after a correct system; not necessarily to facilitate the employment of unintelligent men—though this is too often a powerful subsidiary reason—but because the service demands the best in all respects. It is due the employes that they be given all practicable mechanical aids for the best performance of their work, and the use of such aids may also fairly be demanded by supervising officers to give them confidence and leave their minds free from unnecessary anxiety. There are plenty of reasons for abolishing plain white lights just as soon as an agreement can be reached in regard to a substitute for them.

We have no magic remedy to offer; we simply wish to set forth the principal elements of the question so that they shall not be overlooked by those whose duty it is to act in the matter.

1. "It goes without saying" that a signal should be as distinctive as possible. A "white" light is certainly the opposite of this whenever it is, or appears to the engine man to be, near another white light; and as this condition is very common, the assertion that the only normal night signal is one whose indication is given either by its shape or its color needs no argument for its support. The long use of white without accident is largely owing to the fact that lights are generally on high posts. Aside from the fact that some signals must be on comparatively short posts, the proposition to use colors exclusively is worthy of attention by reason of the possibility such use offers of making all high posts shorter, and so less expensive. Ordinary switch targets are, indeed, low; and many of them indicate all clear at night by an uncolored light; but it is familiar knowledge that hundreds of switches are passed every night by engineers who do not see them. Either by reason of a poor view or careless habits of the runners the switches are passed without being seen in season for the sight to be of any value; the claim that white is successful as a night switch signal is therefore lacking in force.

2. Green is considerably used for all-clear in ordinary switch lights. This makes its use as a cautionary signal in semaphores somewhat inconsistent, and strengthens the demand for a green all-clear signal in the latter, if general uniformity is to be sought.

3. The claim that green and red are the only available colors for night use is, to say the least, not proved. Purple glasses used for back lights are by most people instantly distinguished from either red or green. Purple is, indeed, less available for long distances than red or green, but it is quite possible that the necessity for making signals visible at a great distance is less important than it is generally held to be. The most perfect system of signals provides for running trains at full speed even during a dense fog; if safety and celerity can be secured with a short view a part of the time, why not all the time? It is not necessary to carry this argument to its full length to show the feasibility of other colors than red and green. The possibilities of blue as a night signal have never yet been satisfactorily tested. Officers who do not deem it necessary to weed out color-blind persons from their forces, or who realize the danger from that defect but have not the courage to examine their men, can find an objection to the use of green for safety and red for the opposite in the fact that these two colors both appear to the color blind as gray; but the detection of this fault in the vision is so simple and so certain, and has been so successfully carried out on so many roads, that we give this con-

sideration no weight. If the freedom of all the engineers and other trainmen from color blindness is not to be ascertained as a certainty, all color signals should be abandoned.

4. The argument for the use of white because it is consistent with the all-clear day signal would fall to the ground if white were abandoned in the day time. Such abandonment is not by any means out of the question. The use of semaphores of a neutral color is one indication of the tendency away from traditional practice. White is the absence of color, and an important principle in signaling is that which requires the absence of an object that is ordinarily visible to be regarded as a danger signal. In fact, there is ground in this theory for completely reversing the present order, and treating white as an indication of danger or caution instead of safety. It is not necessary to follow this theory to its fullest extent, and it would be impossible in our present space to mention all the points bearing on the general question; but the subject deserves more consideration than it receives, and the one principle that was violated in the practice at Interlochen (the location of the derailment we have referred to), and which is violated in a thousand other places—the principle which requires every breakage or failure of apparatus or fixtures to indicate danger, is sufficiently important to justify such consideration.

European Passenger Rates.

A series of figures has been recently laid before the French House of Deputies, in connection with some proposed measures of reform, which enables us to extend to other countries the comparisons which we have made between England and America.

The nominal rates, forming the basis of regular, one-way tickets, are as follows:

	Class I.	Class II.	Class III.	Class IV.
France.....	4.0	3.0	2.2	...
England.....	4.1	3.1	2.	...
Belgium.....	3.1	2.4	1.6	...
Holland.....	3.4	2.7	1.7	...
Germany.....	3.2	2.4	1.6	0.8
Hungary.....	2.4	1.6	0.8	...
Switzerland.....	3.4	2.4	1.7	...
Italy.....	3.6	2.5	1.6	...
Spain.....	4.2	3.2	2.0	...
Russia.....	4.8	3.5	1.8	...

These figures taken by themselves are an unfair basis of comparison, because many of them are given only on the slowest trains, to passengers without baggage.

England gives express service and free baggage at the rates named in the table. France gives free baggage, but her express trains as a rule carry only first class passengers, and the very fast ones charge from 20 to 50 per cent. above first class rates—5 or 6 cents a mile in all. Belgium does not, or until recently did not, allow free baggage on local tickets. It carries second and often third class on express trains, at but slight additional charge. Holland and Switzerland are much like Belgium in these respects. North Germany allows free baggage, and has a great many third class express trains, at slight additional fare for each class; South Germany is less liberal in these respects. The Hungarian figures are minima, baggage and express service being charged at high additional rates. Italy allows no free baggage; express trains carry first and second class. In Spain and Russia the so-called express trains have only first and second class, often at advanced rates of fare; but a Spanish or Russian express is, by the American standard, a slow accommodation, while the ordinary passengers in those countries are conveyed at speeds which in America would be a disgrace to a self-respecting freight train.

On the other hand it should be said that, in many of the countries named, round trip, excursion, and commutation tickets are granted on very liberal terms. The result is that the actual receipts per passenger mile are very much lower than the schedule fares would indicate. They are given as follows:

	Cents per mile.
Belgium.....	1.16
Germany.....	1.31
Holland.....	1.65
Italy.....	1.75
France.....	1.78

The last named figure seems high, but it is to be remembered that French third class rates were decidedly raised in 1883. The Belgian figure, on the contrary, is extremely low, especially as compared with Holland. We give these last figures for what they are worth, without feeling sure of their accuracy.

How is it that some countries can give these low rates, while others cannot or at any rate do not? In other words, what are the conditions affecting relative passenger economy in different countries?

The first condition necessary for making cheap passenger traffic possible and profitable is density of population. If we compare the different parts of the

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