



OUTSIDE THE PENNSYLVANIA DEPOT AT JERSEY CITY, SHOWING THE SIGNAL LIGHTS SET FOR THE DEPARTURE OF THE MIDNIGHT EXPRESS FOR THE WEST

RUNNING A TRAIN AT NIGHT

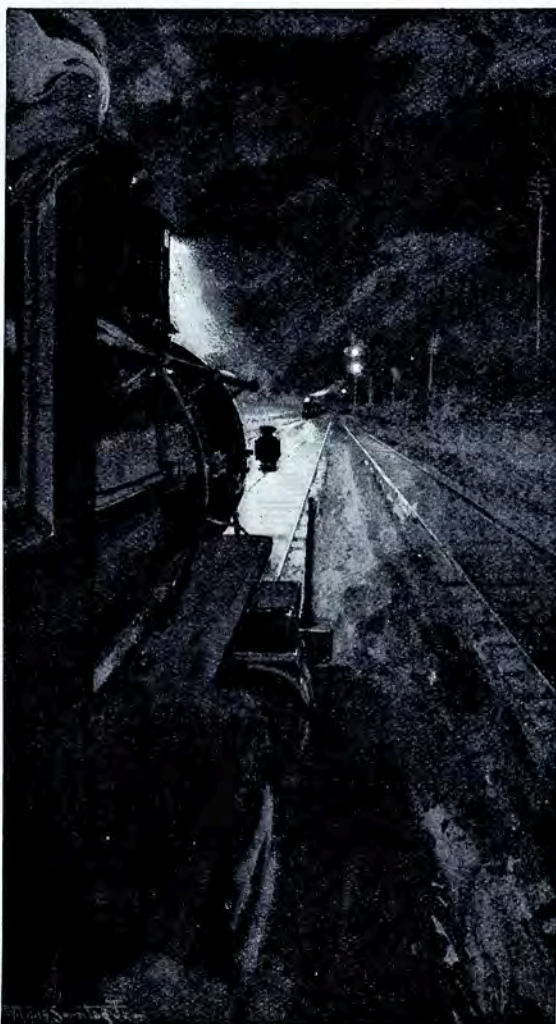
By John Gilmer Speed

DRAWINGS BY W. LOUIS SONNTAG, JR.

THE most remarkable achievements of modern civilization, probably, are those which affect traveling, making it at once quick, comfortable and secure. We cross States and Continents at the rate of thirty miles an hour, with greater security against accident than our grandfathers enjoyed in their stage coaches, and we have, even when on the cars, comforts unknown in the palaces of kings when our grandfathers' grandfathers were young. All this has been brought about by the improvements in railroad construction and operation, which is now in its highest development, so well nigh perfect that we go to bed in our sleeping-cars without a thought of danger, and though we are at the moment being propelled through space with marvelous swiftness, we are, when on a first-class road, as free from chance of peril as we would be in our beds at home. That sounds like a hazardous statement, but the facts are such that it is by no means unwarranted. The Inter-State Commerce Commission gathers each year the statistics of all accidents on the railroads in this country, and the figures here used are taken from the report for the year ending July 1, 1894. The report shows that during the year one passenger was killed for every 1,985,153 passengers carried, and that one was injured for every 183,822 carried. This surely is as safe as living ordinary humdrum lives in large cities. The report further shows that a man's chances against injury were such that he would have to travel 4,406,659 miles before getting hurt, and go 47,588,966 miles before being killed. At the rate of thirty miles an hour a man could travel, if nature permitted, on American railways for one hundred and eighty-one years, without leaving the cars, before being killed, or with the same amount of security against accident he could go round the earth nineteen hundred and three times before meeting his death by accident, and one hundred and seventy-six times before getting hurt.* These figures explain at once our sense of security when traveling, and the low rates of accident assurance, which are not increased when the insured starts on a journey however long. Indeed, there may be no hesitation in saying that in a seat in an express train on any of the great American trunk lines a passenger is immeasurably more safe than in a cable car or a trolley car, or as a pedestrian on the busy thoroughfares of our large cities. The statistics from which these deductions have been made embrace all the railroads in the United States—good, bad and indifferent. Those who have traveled a little out of the beaten track, and who are therefore acquainted with the condition of the single-track, second-class railways, will readily believe that passengers who travel

only on the great railroads which have adopted every modern improvement in construction, maintenance and operation, are much more secure against accident than the figures given show them to be.

THIS immunity from danger to the traveling public has been the result of the wisdom and the experience and the ingenuity of three generations of railroad men, who have considered that to attain the present condition no cost was too great and no detail too small. They have, therefore, worked to a good end and to a great end, so that whether we travel by day or by night we can dismiss care from our minds and be reason-



AS THE TRACK AHEAD LOOKS AT NIGHT TO THE ENGINEER FROM THE ENGINE-CAB

lem requires him to keep the line as nearly straight as possible, and prevents him from adopting steep grades, he must always think of the nature of the soil into which he is to cut, and of the habits of the streams he is to cross or to follow. These locating engineers, with their transits and levels, not only examine the straight line which seems likely to the eye to be where the centre of the track will be placed when the roadbed is finished, but they examine instrumentally the ground on either side of this line, and then, after all has been put on paper, determine with mathematical precision where the line shall be located. A generation ago this care was not taken, and more frequently than not the company building did not have the means to adopt in the first instance the best location. In recent years where badly-located roads have had the advantage of prosperous traffic, new locations have been made and better grades and alignment secured. Sharp curves are hazardous in operation, while steep grades are expensive both of fuel and time, and quite dangerous when anything goes wrong. And while merely human agency is employed to prevent things from going wrong there is always present a liability to accident. In railroad construction, therefore, the engineers count on this human fallibility and try to so build that the chance for mishap will be reduced to its very lowest. The line being as straight and level as possible it is necessary to secure the track in a very solid fashion. This is done by bolting the rails together and spiking them to heavy and sound cross ties. But this does not yet make a solid roadbed. The final touches are put on



THE MIDNIGHT EXPRESS ON ITS WAY TO THE WEST

ably sure that we will reach our journey's limit on the stroke of the clock as per schedule time. The ordinary traveler understands, in some measure, the security of running trains by daylight, when the engineer can see a clear track stretching out for miles ahead of him, but how it is managed in the darkness of night is something of a mystery. To explain this is the purpose of this article, but to make the matter clear it is necessary, in a general way, to speak of some things that are only a trifle less important in the day than in the night.

In the first place, the roadbed must be constructed with great solidity and skill, so that the banks of cuttings will not cave in and cover the track, and so that embankments will not be washed away by freshets. When the road is first projected the locating engineer takes these contingencies into consideration, and while the solution of his prob-

with what is called ballast—which generally consists of broken stone between and underneath the cross ties, so that the latter shall have a level bearing, and be kept in place no matter what the changes in temperature, no matter how heavy the train that goes over the rails.

THE bridges on a railway need, of course, to be constructed with the greatest possible care, and at the present time, owing to the improvements in making steel, these structures are much more stable than they used to be. In designing them the engineers make them strong enough to withstand a moving load five times as heavy as any train that could be placed upon them. With such precautions bridges should never fall, and if they be kept in perfect condition by constant repairs and never-ending watchfulness, they will not break through. In recent years, in addition to the timber guard-rails, which are placed on either side of the rails on bridges, the rails themselves are fastened to the cross ties more securely than was formerly the practice. This is accomplished by the use of interlocking bolts which replace the ordinary spike and are morticed into each other in the cross tie and beneath the rail. Such bolts cannot pull out, nor will they permit the rails to spread and let a train down with a jolt. Many serious accidents have been averted by the use of these bolts, and upon one occasion which I have in mind they prevented a whole train, containing a hundred or more passengers, from going through a bridge into deep water below. Where it is possible even these strong steel bridges on the best railroads are replaced by stone arches. Improved bridge construction has added very much to the safety of railway travel, and American engineers have been foremost in originating designs where both safety and economy have been attained at once.

The next, and a very important consideration in the security of travel is that the rolling-stock—the locomotives and cars—shall be strong and suitable for the demands that are made upon it. The improvements in locomotive and car building have been very great since the railroad era began, and are being added to constantly.

* In these statistics passengers only are taken into account. Trainmen and other employees are killed and injured more frequently than passengers.

