THE GREAT EXPOSITION—LETTER FROM UNITED STATES COMMISSIONER PROFESSOR R. H. THURSTON.

NUMBER 9.

VIENNA, August, 1873.

The labors of the international jury are occasionally intermitted for a day, and its members are given an excursion to some peculiarly interesting district in the environs of Vienna. Evening receptions by the Emperor, or by the nobility of the Austrian capital, or even the excellent dinners given by the Arch Dukes, can hardly be considered as very greatly relieving the fatigue of a long day's work, although they are exceedingly pleasant. But an excursion into the country for a day is wonderfully rest-giving.

One of the pleasantest of these excursions was that to which the whole jury were invited, with a few gentlemen of the press and others, by the management of the exhibition. The party were taken over the

SÖMMERING PASS

to Murzzuschlag, returning to Vienna after dining at that station.

Starting at about eleven o'clock, on one of the hottest days of the season, the train ran, at what was considered in Austria very high speed, through the level country in the immediate neighborhood of Vienna, but soon slowed down, as moderately heavy grades were met after reaching the base of the mountains. Sixteen miles from Vienna, Vöslau was passed, a lovely spot, noted for its beautiful scenery, its excellent baths and its fine wines; and from this point the grades became heavier, and the engineering skill which had been exhibited in the construction of the road over this mountain range became more and more strikingly exhibited. The greatest amount of skill and labor has been expended upon that portion which lies between Gloggnitz and Sömmering, a distance of about twenty-five miles. The average gradient on this section is something over sixty feet to the mile. There are fifteen tunnels and sixteen bridges, some of which are of large size. The last tunnel is situated about three thousand feet above the sea level, and is more than four thousand five hundred feet long. Many of these tunnels are ventilated, and in some degree lighted, by lateral galleries opening out on the steep face of the mountain. The bridges are of stone, and are well designed and solidly constructed. The size and the solidity of the culvert arches, which have been constructed to afford passage for the floods of water which, after severe storms, rush down the mountain sides and across the line of the road, were particularly noticeable. The care taken, at all exposed points, to protect the road against washing would appear in the United States somewhat extraordinary when compared with our own average practice in even such localities. The whole road is, from beginning to end, thoroughly well built. The cost of this section was 14,000,000 florins, or about seven millions of dollars. A similar piece of work in the United States, in consequence of the difference in cost of labor, would have cost nearly as many dollars as this has cost florins. This railroad over the Sömmering Pass is probably one of the finest examples of engineering to be seen in Europe.

The scenery along the line is exceedingly beautiful. The road follows the sides of the valley, sometimes crossing it and apparently reversing its direction; and at every projecting point, the traveler looks far up the valley where green hill sides rise one above another and, far in the distance, are themselves overshadowed by the highest peaks of the mountain range. Or he has a more beautiful and a wider, though less picturesque, landscape spread before him as he looks down into the valley and traces the stream in its meanderings toward the greater valley of the Danube, among many villages, and through fertile fields, yellow with ripening grain or green with vineyards.

At one point the road crosses the valley on a long high bridge; and the view on the one side extends even to the snow-covered top of the well named "Schneeberg," which glistens still, even under the fierce rays of this midsummer sun, and contrasts strikingly with the lower peaks about it, covered, as they are, with vegetation. On the other side the view from the same point reminds one somewhat of that beautiful spot nearer home, the valley of Wyoming, as seen from the hights above Wilkesbarre, and is pleasing beyond description. Sömmering is the highest point of the pass, and is about three thousand feet above the sea.

Passing through the long tunnel piercing the mountain, which still rises far above, the traveller finds himself, on emerging, in the midst of a landscape completely in contrast with that which he has just left behind. The scenery has a quiet beauty which he could hardly have believed it possible to find so near while he was admiring the rugged and picturesque last view above Sömmering. There seems here a different climate also, for on the one side the farmers are just cutting their hay, while on the other they are completing the work of harvesting their grain. From the next station,

MURZZUSCHLAG,

down to Trieste or to Venice, the scenery is very beautiful in many places, but probably nowhere equal to that on the Sömmering side of the pass. At the place just named, the party of excursionists found a good dinner and excellent concomitants awaiting them, not the least of which was the music, both vocal and instrumental, which was furnished by a large body of musicians.

While this important railroad interests the stranger by the solidity of its construction and by the skill and energy which have their monuments in every section, there is but little to be said of its rolling stock. It is usually of what may be said to be the standard European type, and the locomotives are such as are generally in use elsewhere for heavy work. They are well designed and apparently well made.

The exhibition contains a large number of

GERMAN AND AUSTRIAN LOCOMOTIVES.

They are of many types, most, if not all, of which are well known at home. They are now usually fitted with the American cab, a detail which the continental builders have been more prompt in adopting than have the British. The frames, instead of being made of forged bars of rectangular section, as is customary in the United States, are cut out from rolled plate, which, for heavy engines, is at least thirty millimeters (one and two tenths inches) thick. The cylinders are usually outside, and the valves are frequently driven by eccentrics placed outside the crank pin, and without the intervention of rock shafts. The boiler is now generally made with that portion surrounding the firebox considerably enlarged, in order to obtain a wider grate and a higher steam space over the crown sheet. Instead, however, of making the top of this portion semi-cylindrical, as is the practice in the United States, the top and sides are made flat, the outside of the boiler being thus made like a rectangular box with rounded corners. The cylindrical part of the shell surrounding the tubes is connected with the enlarged part just described, frequently by a single sheet which is cut out and flanged on the one side to take the former, and is flanged around the edges on the other side to meet the shell surrounding the fire box. This makes a very perfect and strong connection between the two portions of the shell, and, at the same time, forms an expansion joint. It is evidently a favorite method of construction here; but whether better than our American method of accomplishing the same result, it is difficult to say. These flanged sheets, such as have just been described, make rather a neat piece of flanging, and seem to be favorite *pièces de rêsistance* with the principal exhibitors. A number are exhibited in steel, and among these are some of the best specimens of such work to be found in the exhibition. One of the very best is shown in the Creusot exhibit, where also is the most beautifully finished locomotive engine to be found in the building. As such finish can only be given to the very best of material, this engine probably stands unequaled in material and finish by anything here. Steel is employed for nearly all parts which were formerly made in wrought iron. The favorite grade for the locomotive builder's purpose seems generally to have so small a proportion of carbon as to be properly iron. This proportion frequently falls to one quarter of one per cent. This metal, when made from good pig iron and with proper care, is much stronger than merchant iron, except, possibly, in rare instances and with the very best and highest priced brands; it is perfectly uniform in strength and quality, and takes a magnificent finish. This metal has a tensile strength of from sixty to seventy thousand pounds and upward, and stretches more than one fourth before finally breaking off, and can be relied upon to do this invariably, say those who are using it Each piece is also uniform in structure and in strength throughout.

The section assigned to

GREAT BRITAIN

contains only two or three small machines, for use in making up trains about stations. Neither Great Britain nor the United States illustrate their present practice in building heavy engines.

RUSSIA

exhibits two locomotives of good design, of apparently good materials, and of exceedingly creditable finish.

ITALY

exhibits one of the engines used at Mont Cenis. It is of the usual continental type for such work, with four coupled drivers, and of the following principal dimensions, as given by the exhibitors, in meters: Cylinders, diameter, 0·43, stroke, 0·62; grate, 2·25 × 0·98; surface, 2·205; number of tubes, 91; diameter, 0·045; heating surface, 103·49. Steam pressure, 9 atmospheres. The machine would look a little rough by comparison with an ordinarily well finished American engine.

On the whole, it would appear that the changes now going on in European practice, in construction of locomotives, are principally in the introduction of a better material, and that such slight changes in design as are noticeable are usually in that direction in which the builders of the United States have preceded them

There are quite a number of road locomotives, or

TRACTION ENGINES

exhibited in the British section. Messrs. Fowler, the well known manufacturers of steam plows, exhibit their road locomotive. It is of good form, well made and neatly finished, and looks serviceable. Messrs. Aveling and Porter exhibit examples of their several designs, among which is one of the size of the machine which did such good work at South Orange, N. J., last autumn. This engine is fitted with a small crane, and is frequently seen about the lower end of the enclosure, transporting heavy stones or huge boxes from place to place, with far greater celerity and handiness than could any team of horses. Another engine is attached to a train of great wagons heavily loaded with stone.

A French traction engine is exhibited, which is fitted with the Thompson india rubber tyres, and which is often trundled across the grounds regardless of obstacles or of pedestrians, at a speed and with a facility in manœuvering which are as admirable as intimidating. The action of the flexible tyre, as it continually maintains its broad area of contact with the rough ground as the wheel turns, is very interesting; and if, as the exhibitor maintains, success has been attained in securing great endurance and comparatively low first cost, there must be, as he also asserts, many situations in which they will find profitable use, and where the usual form of tyre is inadmissable.

The introduction of road steamers to take the place of horses for heavy work seems one of those phases of progress which are only noticed by a few. Messrs. Aveling & Porter are doing an immense business in building their machines; other firms, English and French, are also doing something in the same direction; and in the United States, where some of the most skillful pioneers in this direction have labored, there are strong symptoms of ultimate success in the use of steam for, at least, all heavy transportation. Such success will probably secure the advantages of great convenience as well as of cheapness, and the removal of the multitudes of horses which now crowd our streets will be productive of sanitary advantage also.

The pressure of steam carried on locomotives, and on some of these traction engines, is usually eight or nine atmospheres, as it is reckoned here. The boilers are usually rather stronger than those built in the United States for the same pressure. The riveting is generally snap-headed, and is very usually done by the steam riveting machine. Where done by hand, the large rivets are headed up by the blows of heavy hammers upon a forming tool. The plates, along the edges of the laps and around the rivets, exhibit, too frequently, that scoring which is to be regarded as a sign of carelessness on the part of the workmen.

Probably the very best

BOILER WORK

exhibited is that of Adamson, of England. His boilers are of steel plate, with the exception of the heads, which are of one piece of heavy iron. Every lap is planed and every rivet hole drilled. One of his most beautiful pieces of work is a boiler having large flues, across which are carried the Galloway tubes. These tubes, however, are welded in instead of being riveted, and so neatly is the work done that it is impossible, in some examples, to find the weld. Such conscientious work is seldom seen on steam boilers, and deserves full credit when found.

R. H. T.

Improved Whips.

We visited not long ago, at New Haven, Conn., the works of the New Haven Whip Company; and although the general process of manufacture is substantially the same as in other whip works, still we observed certain peculiarities that are worthy of note. In this establishment they are not afraid to permit visitors to inspect every branch of their operations, the reason being that only the very best of materials are used in the manufacture. In some concerns, visitors are excluded for fear of disagreeable revelations, it being common in such establishments to introduce shoddy stuff into the interior of the whip, covering it over with the usual braiding, the whip thus made having an appearance upon its exterior as good as the best, although in reality it is an unworthy production.

At the New Haven whip works, the specialty manufactured is the patent whip tip. The old plan was to make the long slender tip in one piece with the handle; and when the tip was worn out, the handle and all was rendered worthless. The handle if properly made will out last many tips; and the New Haven Whip Company make the tips separate from the handle, but attached thereto by a screw connection; so that when one tip is worn, another tip may be quickly substituted. Thus a few cents expended in tips will keep one supplied with a good whip for years. Tips of different colors, lengths, or qualities may be used on the same handle.

The manufacture of the patent whip tips has become quite extensive. The company above mentioned holds the exclusive right to this description of goods, and supplies only first class articles. The body of the ordinary handles consists of a central core of whalebone, stiffened and filled with rattan. This is now enclosed in rubber cloth and covered with rubber cement, so as to be impervious to water. The next operation is to braid upon the exterior a finishing covering, composed of some thirty strands of cotton, silk, or gut, according to the quality desired. The braiding is done by machinery, by girls, and is a curious and rapid operation. After braiding, the whips are repeatedly varnished, dried, and packed for market. The finer varieties of handles made by the New Haven Whip Company are composed of holly wood, imported from England, and Molucca wood, also imported. The company is entitled to much credit for the excellent and thorough manner in which their goods are prepared, which have a high reputation in the market.