AERIAL WIRE ROPEWAYS.*

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ROPEWAYS generally (apart from telpherage installations) may be roughly divided into two main types—the single-rope and the double-rope systems. In a paper by Dr. Gisbert Kapp on the subject, he stated that "mechanical telpherage is only practicable on straight lines, or lines with few and very easy curves, subtending small angles." The reason for this was that the rope saddles then in use, owing to their "passive" form of adhesion to the rope, would not keep to the rope in going round the curve wheels which keep the rope in position when going around these angles, and it was necessary, when coming to a curve wheel, to run the carrier off the rope altogether, by means of a switch run rail, and so conduct the carrier beyond the obstruction until it could run on to the straight part of the rope again, on the fresh tangent.

In practice, however, it was found, with the rigid or passive form of saddle, that owing to the very narrow space naturally provided between the jaws of the fixed saddle, the saddle did not always engage properly on the rope, and "missed stays," so to speak, if there happened to be any extra swing on the carriers due to the wind, or gumping, or other cause. Consequently it was found desirable, if not indeed actually necessary, to keep an attendant always on the spot to put right any such strayed carrier, otherwise the fresh on-coming carriers would only block the line.

This releasing of the saddle from the rope was also necessary at the return terminal, a circular shunt rail being provided at this end to convey the carrier around, and free from the return sheave, and involving the services of one or two men for the purpose. Consequently, automatic return of the carrier at the return end of the line, such as is now customary with the double-rope system, or automatic negotiation of angles *en route*, was not possible with the saddles having fixed jaws. With the "positive" type of saddle, however, the jaws of the gripper have a definite hold on the rope, and do not let go even when going through curves *en route*, or when going around the return terminal. In this case the outer end of the fixed jaw is made V-shaped to fit into the groove of the return wheel. The inward tension of the rope pulls this jaw into engagement with the groove of the wheel, which thus supports the weight of the carrier, either loaded or empty, whilst the carrier is carried around the wheel by the action of the rope, without the necessity of a supporting rail at all at this point. A modification of a similar arrangement is also provided for automatically going around curves *en route*, thus overcoming one of the chief objections to the single-rope system of ropeways, especially where angles have to be negotiated.

Sectional Working.—These aerial ropeways can be used for lines of 20 miles, or even more, in length, but in that case it is necessary to divide the line into sections of about five miles each, as otherwise the rope would be so long and so heavy as to be beyond the range of practical working. Each section is provided with its own separate driving and tension terminals, and the carriers run from one section to the other, mainly automatically, the connecting rail being made with a suitable gradient.

It will be readily understood, especially on a long ropeway of this description, that it is advisable to use as small a rope as is practically possible, in order to reduce the mass of dead weight to be moved, apart from the weight of the actual loads and carriers, and supporting sheaves. The loads are, therefore, usually made in as small units as possible, as it is obvious that the size of rope used, and, therefore, its weight, depends primarily on the maximum unit weight to be carried, though, of course, the maximum length of span employed on the line, and, therefore, the aggregate number of loads on this span, is also a determining factor in fixing the strength of the rope that must be used throughout. It is interesting to note that spans up to and even exceeding 2,000 ft. can be readily employed on this system.

Where large carrying capacity is required it is necessary sometimes to duplicate the whole line; that is, to use two separate and distinct ropes, each with its own driving and tension arrangements, the double ropes or four ropes in all, being mounted on the same supporting standards. By this method up to 200 tons per hour can be carried, though where these heavy duties are required it is generally advisable to use the double-rope system, as much heavier and stiffer ropes can obviously be employed when they are merely fixed and not required to be moved along. It is, therefore, to the double-rope system that one must look for the real work that aerial ropeways are capable of doing.

No longer are designers of ropeways satisfied with installations dealing in small figures, with limited carrying capacities and small gradients, requiring skilled labor attendance, and the necessity of always going in straight lines. It is in this system that the greatest improvements have been effected, both in general design, and also in details, with the result that ropeways are now made of very great length, capable of dealing with unit loads of four or six tons each, and with a carrying capacity of 500 tons per hour if need be, and comfortably negotiating gradients of up to 1 in 2 against the load, automatically traversing around angles, both vertical and horizontal, *en route*, with automatic tipping anywhere along the line, and with automatic return of the carriers, and the employment where necessary of long spans of upwards of 6,000 ft. or more,

The carriers are automatically connected to the hauling rope on the loading rail, and automatically disconnected from this rope on their return, empty, to the loading end, so that for capacities of up to 25 tons per hour one man only is necessary for the entire working of the line. In this system, one rope is fixed, and the carriers travel along the rope itself (instead of with it, as in the first system), being drawn from end to end by a separate haulage or tow rope, which is naturally of much lighter construction. A separate fixed rope, generally of relatively light construction, is provided for the return, or empty side of the line, where loads are required to be carried in one direction only.

The ropes are supported between two terminals, at intervals of usually 100 to 150 yards, on steel or wooden standards, by means of saddles of varying design, some being fixed, whilst in some cases the saddles are free to rock on a pivot, the better to accommodate themselves to the gradient of the line. In one system, however, the carrying ropes instead of being continuous the whole length of the line are divided into separate lengths or

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