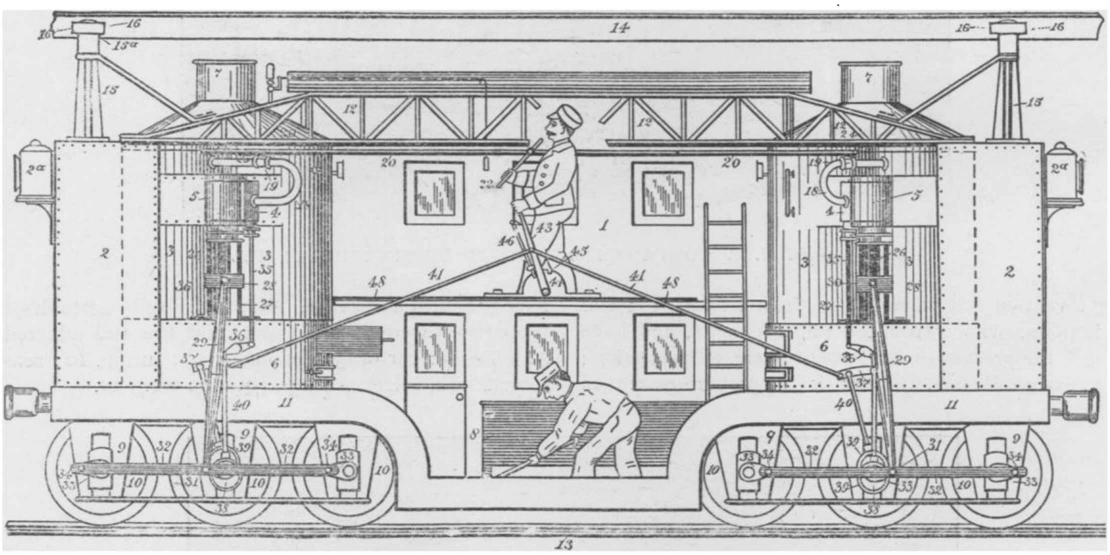
ties). The various manipulations were formerly performed by hand, but all are now done by machinery. The vegetables thus prepared are then dried in kilns and on lattice work trays by currents of moderately hot, dry air, thereby retaining their natural color, flavor, and aroma. This stage of the process requires the greatest care and attention, so as to keep the temperature constantly at the level ascertained by experience to be necessary for each kind of vegetable. The vegetables and herbs are then carefully mixed in the proportions given above, and then compressed to one-eighth of their original bulk (when fresh) by powerful hydraulic pressure into moulds, thus forming square slabs about three-quarters of an inch thick, grooved so as to be divided into cakes of five rations each, at the rate of one ounce per ration, easily separated for convenience of issue. These slabs are then wrapped in paper, and packed by machinery into square tins, which are hermetically soldered. Before the lid is soldered down, a punch stamps it automatically from the inside with the season of manufacture. When two years appear on this stamp, as "1888–89," the first is the year of the crop, and the second the year of compression. The tins are now made of bright "coke" tin-plate of the best quality, it having been found by experience that the vegetables keep much better in this material than in the dull terne-plate formerly used.

The vegetables and herbs are also prepared separately, as there is a greater demand in some quarters for some kinds than for others: as, for instance, in South Africa, for compressed celery as a cure, when stewed, for rheumatism caused by sleeping on the open veldt; in India, for compressed onions, to make a soup considered a sovereign remedy for the effects of over-indulgence in spirituous liquors; in the Hudson Bay territory, for the same article as a generator of warmth in the stomach; and in Burmah, for compressed apples and pears, which are prepared in a similar manner to the vegetables and herbs. All these vegetables, herbs, and fruits are also obtainable in their dried and desiccated condition, without being compressed into cakes. In either state they are extremely convenient, portable, and useful, as are also the prepared and condensed soups and flours made from potato, pea, lentil, haricot bean, carrot, chestnut, etc. They are, moreover, wholesome; and the use of these vegetables, fruits, etc., will probably become more widely extended.

The Engineering and Building Record appeared in a colored cover last week, and is enlarged by the four pages which the cover made. The improvement has been under consideration for a considerable time, and, as the current volume closes with the last issue for November, it seemed best to make it now. The getting of a cover which should at once be distinctive in color and meet all the other requirements was no easy task, and the reader is left to judge of the result finally reached.

THE BOYNTON BICYCLE RAILROAD.

IN last week's issue we briefly described the Boynton Bicycle Railroad at Gravesend, between Bay Ridge and Coney Island, a few miles from this city. The novelty of the Boynton system, and its vast possibilities in the line of high speed combined with safety, which rest on the fact of its running, like the bicycle, on one rail, justify us in giving our readers some further particulars concerning it. Among the advantages inherent in this system (in which the train is like a wide plank on edge), the development of which is only a question of the proper adaptation of means to ends, are the following, as given by a competent and disinterested authority on engineering: 1. A great increase in smoothness of motion at high speeds, permitting an almost indefinite increase of speed without danger in this respect; 2. A diminished air resistance, due to the narrower vehicles and running-gear; 3. A narrower road-bed, less costly to construct and to maintain. To these may be added the much greater ease, smoothness, and safety in rounding curves at high speed, as well as the excellent facilities for electrical propulsion afforded by the guard-rail overhead. Another advantage, the great flexibility of the system, must not be neglected. It is as well adapted to the slower and heavier freight traffic as to the light and rapid passenger service; to the high speed



FREIGHT LOCOMOTIVE FOR THE BOYNTON BICYCLE RAILWAY.

and frequent stoppages of city and suburban rapid-transit trains as to the long runs of the limited express on trunk-lines; to electrical as to steam propulsion; and to elevated or underground as to surface roads. Its development in all these directions must follow as a necessary consequence to its successful introduction in any one of them. For this reason the progress made in perfecting the details of the system, at the Gravesend road and elsewhere, will be watched with unusual interest by the intelligent people of every country in which railroads have been introduced.

The section of road at Gravesend upon which the Boynton system is used had long been abandoned by the company formerly operating it, as they had secured a more direct route with fewer heavy grades. It was in poor condition, owing to the decay consequent on long disuse; but as in some respects at least (such, for instance, as high grades and several sharp curves) it was well adapted for showing the merits of this system, it was secured by the Boynton Company. They equipped it with an overhead guard-rail, and are getting the road-bed and track into good repair as speedily as possible, so that they will soon be able to double the speed of the trains without danger of accident from defective ties, etc. Even in its present state, with the train-speed limited by unfavorable conditions to a fraction of that possible under more favorable circumstances, this short railroad is attracting a great deal of attention, not only from railroad men, but also from men eminent in engineering, electrical, and scientific circles generally.

On Saturday of last week a representative of this paper was present at an experimental trip over the road, made to test the results of some repairs to the track and road-bed, as well as to give an idea of the workings of the system to a party of gentlemen interested in railroad matters, among whom were a few from Europe. The run over the road was fully up to the expectations of all present, the train gliding along as smoothly, and as free from jar or oscillation, at the highest speed reached as at the slowest. Even when rounding curves of short radius at high speed, where cars are subject to the violent and disagreeable oscillations caused by the difference in level of the rails combined with the centrifugal force due to the swing around the curve, the Boynton car, on its one-rail track, ran as smoothly and steadily as on a tangent. In fact, the only thing to indicate that the car, when rounding a curve, was not running on a straight stretch of track, was the slight incline given the car by the guide-rail overhead to counteract the centrifugal force caused by the rapid motion and curvilinear course of the train. Inequalities in the track also, which make themselves manifest by oscillations in ordinary railroad travelling, merely caused a slight vertical motion of the car, softened, of course, by the springs. To sum up the impressions produced by a ride over the road, every thing seems to indicate that Mr. Boynton's theories are based on correct scientific principles, that his system solves the problem of high speed combined with safety, and that for a continuous speed greater than fifty miles, reaching perhaps a hundred or more, — a speed urgently demanded by present business methods as a natural sequence to telegraphic and telephonic development, — Mr. Boynton's system, or some modification of it, must necessarily be adopted.

Our illustration shows a freight-engine of a type designed by Mr. Boynton for the bicycle or single-rail system of railroad. Though presenting many novel features, being intended for great hauling power rather than high speed, it embodies the same general principles as the high-speed locomotive illustrated and described in our issue of last week. It carries two boilers, two cylinders, and two sets of drivers. The two-story cab is located midway between the boilers, so that one engineer and one fireman control both parts of the engine.

THE KONGO RAILWAY.[1]

IN November, 1885, a syndicate of English capitalists, headed by Sir William Mackinnon, was constituted with a view of obtaining from the Kongo State the concession of the railway from the Lower Kongo to the Stanley Pool. The time, however, had not yet come for great enterprises on the Kongo. Stability was not yet sufficiently secured. The political work was not sufficiently advanced; so that capital, in order to insure its security, was obliged to demand powers which the Kongo was unable to grant, so that the negotiations fell through, and the English syndicate was dissolved.

Shortly afterwards the affair was taken in hand, at my suggestion, on a more modest scale, by the Compagnie du Congo pour le Commerce et l'Industrie, constituted with a capital of 1,000,000 francs, which sum was afterwards raised to 1,225,000 francs, with the immediate object of studying in a practical and definitive fashion the possibility of laying the railway. The statutes were drawn up, however, in order to allow the Compagnie to become, by simply increasing its capital, the company for laying and working the railway. The Compagnie du Congo was definitely constituted on the 9th of February, 1887. By the 8th of the following month of May, the first expedition of engineers left for the Kongo. On the 10th of June a second group sailed from Antwerp. At the end of July the gangs, assembled at Matadi, were composed of one director of survey, twelve engineers, and one physician. Those who had arrived first determined the geographical position of Matadi, made some soundings to satisfy themselves of vessels of a large draught being able to land without considerable works, and reconnoitred the environs. From the first days of August, work began. One study-gang walked in advance, reconnoitring the country, and determining rapidly, by means of the levelling-compass, the zone of the ground to be surveyed. Three gangs, each composed of three engineers, followed, and drew with the tacheometer the plan of the reconnoitred zone. Haussas, negroes of the Gold Coast, were employed as staff-holders. The zone on which the operations with the tacheometer were performed varied, according to circumstances, from 50 to 200 metres on both sides of the likely axis of the way. The progress of the work, which at the very beginning of the operations was only from 300 to 500 hundred metres per brigade and per day, on the difficult ground near Matadi and Palaballa, soon increased to one or two kilometres, the expedition having passed the mountainous region, and by way of exception was raised to four or five kilometres per day, the maximum space between the stations of the instrument being 300 metres. The operations on the ground continued in 1887 up to December, when the study had been carried on as far as Lukunga. The work then suffered an interruption of four months on account of the rainy season; nevertheless a special gang continued working during January and February, 1888, in order to execute near Matadi the survey of an alteration made in that region to the first direction-line. In May, 1888, the staff having again their full complement, works were resumed. While the chiefs of the gangs went to reconnoitre previously the region which extends between the Lukunga and the Stanley Pool, the other engineers completed the works around Matadi. At the beginning of July the whole staff resumed the operations with the tacheometer. On the 4th of November, 1888, the level was set up for the last time at Stanley Pool, and the engineers went back to Europe.

The railway which is proposed to be laid in the cataract region, according to the survey plans and estimates, will have a gauge of 75 centimetres, with steel rails weighing 23 kilos, steel sleepers at equal distances of 80 centimetres, and weighing 23 kilos, the whole of the line weighing 75 tons per kilometre. The total length of the line will be 435 kilometres. The laying of the first 26 kilometres only will offer some important difficulties, while the remainder of the line will be laid under exceptionally easy circumstances, either in plains by straight lines, or along the hillsides by means of curves of great radius. The earthworks of the first 26 kilometres not only will be much more considerable, but a great deal of it will have to be done by excavating the rock; while farther the cuttings can be proceeded with in argillaceous ground, and nearly always in sandy and friable earth.

If we except the first part, there will be few constructive works, the most important of them being a bridge of 100 metres across the Inkissi, two bridges of 80 metres across the Mpozo and the Kwillu, and six bridges ranging between 40 and 60 metres. The others will have a length of from 5 to 20 metres only in the clear. The construction of the abutments of bridges will be everywhere very easy, as firm soil is to be met with at no great depth from the surface of the ground. Nearly everywhere, except on the first section, the nature of the soil will admit of bricks being made; and in the valleys of the Luima, of the Unionzo, Kwillu, and Inkissi, limestone is to be found in abundance. Fragments of quartzite and sand, everywhere to be met with, will supply the ballast.

The maximum of incline will be 46 millimetres per metre, and will be reached three times during the first portion, where, as a rule, steep inclines will be met with. Nevertheless it has been possible to combine the slopes and horizontals so as to render traction as easy as possible, and during the last 400 kilometres the slopes and inclines are very infrequent and generally insignificant. Likewise, in the first section, curves are rather numerous and of short radius, although the latter will never be less than 50 metres. Thus all the difficulties of laying and working accumulate at the starting-point, — a most fortunate circumstance, as the first section also offers greater facilities for laying; and, on the other hand, by establishing a twofold traction for the first 26 kilometres, and, reorganizing the trains beyond Palaballa, it will be possible to work the whole of the line under far greater economical conditions than if the working difficulties had to be dealt with at some distance from the starting-point.

The locomotives, when loaded, will weigh 30 tons, and drag, with the speed of 18 kilometres per hour, an average useful load of 50 tons.

The starting-point of the railway on the Lower Kongo will be

[1] Paper read before the Geographical Section of the British Association by Capt. Thys.