THE CHANNEL RAILWAY: CONNECTING ENGLAND & FRANCE

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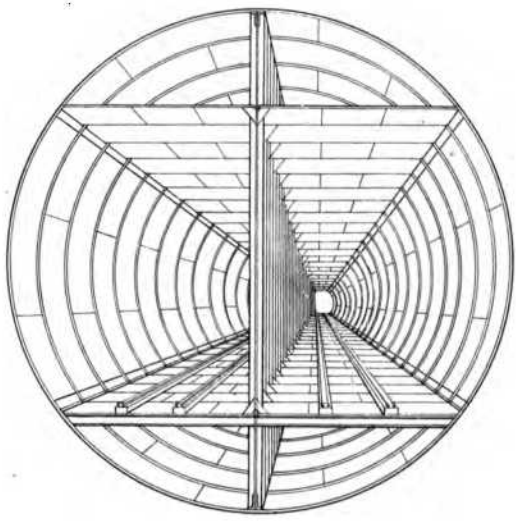

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THE CHANNEL RAILWAY.

CHAPTER I.

INTRODUCTION—THE VALLEY.

GLANCING over the Railway Map of Europe, the intelligent eye traces clustering lines tending to certain points; and, on following them, finds they almost invariably centre in some great city. It cannot fail, however, to notice a remarkable exception to this general rule: on the Continent, from North, East, and South, and in England from South, West, and North, lines are seen drawing together apparently by some attraction, stretching out their iron arms as if they would embrace, when, lo! they have stopped. There is no great city at either of their chosen termini: there is a valley between them; but such a valley as Railway Contractors would delight to make a road through. The land is cheap in that valley, the gradients easy, and the ground firm; but, alas! it is part of the dominions of an old monarch who strenuously refuses to grant the right-of-way, and seeks to impose upon others the restriction originally placed on himself—"Hitherto shalt thou come, and no farther." Strong hopes, however, are now entertained that this valley may be crossed, and the converging lines united.

There are three ways of effecting Railway communication between England and the Continent:—Through the earth by tunnelling under the bed of the sea; through the water within submerged tubes; or through the air on a bridge.

Before proceeding to introduce my project, I will briefly notice a few of the schemes that have already been before the public; and

I do this for the following reasons:—To show how long the idea of roadway communication has existed; how earnestly the accomplishment of this great work is desired on both sides of the Channel; to illustrate the increasing interest that scientific and practical men are taking in the matter; and to enable the reader to compare or contrast the projects of those who have preceded me with the one now before him, in order to judge whether or not I claim too much for mine, in asserting that it is the only practicable method yet proposed for connecting the Railways of England and France. There have been before the world, to my knowledge, twelve projects for this purpose, including the present; and, judging from the names, seven appear to be French, five English; but, if that of Mr. De la Haye, of Liverpool, be classed with the latter, there are then six of each nation. Three projectors, all French, proposed tunnelling under the Channel; seven, two French and five English, propose submerged tubes; a Frenchman proposes an arched roadway, or tunnel, *on* the bottom; and an Englishman, a mammoth bridge.

The idea of tunnelling is much the oldest; a French engineer, Mathieu, sixty years ago, considered the work practicable, prepared plans, and laid them before Napoleon, then First Consul: they were some time exposed in the Luxembourg and other public galleries in Paris; but they have long been lost; and there is now, it appears, no account extant of the then proposed method of accomplishing the work. The project of M. De Gamond, also a tunnel, appeared in 1856-7, and may be reckoned, along with others that appeared about the same time, as fruit of the exhibitions of 1851-4.

De Gamond's project, however, received more than ordinary notice. A commission of eminent engineers, appointed to examine his plans, made a favourable report, and recommended an appropriation of £20,000 to make experimental examinations; and the Emperor is said to have looked upon it with favour; but, notwithstanding the high countenance he received, and the ability displayed in his work, it was finally rejected, on account of its interference with the navigation of the Straits. His plan, briefly, was to form

in the Channel thirteen islands by carrying material out to sea, dig down through them into *terra firma*, and tunnel east and west.

The submerged-tube projectors seem to have given the subject less study than the advocates of the tunnel (present company of course excepted: I must leave to others the pleasure of pointing out *my* defects). Almost all of them, like Pope's troublesome friends, have thrust their crude and half-digested schemes upon public notice with a polite request to "revise it, and retouch," or, "what you'd have it—make it." There is an easy, gentlemanly indifference about them, an *if*, a *might*, or a *perhaps*, cutting the Gordian knot of every difficulty that comes in their way: let one or two speak for themselves.

I quote from an article, by Mr. Wylson, C.E., in the *Illustrated London News*, in which he gives a *résumé* of the plans of previous projectors: the italics are my own:—

Mr. De la Haye says, "My plan is simply to construct wrought-iron tunnels in separate divisions; to sink them on the bed of the water; and then to connect them. * * * It will be admitted that to construct such a tunnel would be an easier matter than to build iron vessels, as it would be the same shape the whole length; then to sink it on the bed of the water would be the work of only a few hours for each division of 400 feet in length. Perhaps the part of the work which will appear the most complicated will be to connect the divisions under water. * * * The operation will be attended with *no extraordinary difficulty to those who can remain during half an hour in deep water.* * * * As regards that part of the tunnel which would be near the shore, it would be sunk under ground, and covered with stones fastened together, so as to render them immoveable. * * Then the railway will be formed in forming the tube; there will be no hills to cut through, valleys to fill up, or arches to build; in short, the sum total of the work is comprised in the tunnel itself.

"Supposing the divisions to be 1000 feet in length:—

"In that case, only 104 divisions would be required to join the rails of the South-Eastern Railway with those of the Calais and

Paris. Now, *supposing* each of these divisions would cost £40,000, the cost of the whole would be £4,160,000; and if we allow for the expense of *throwing* them in deep water, of connecting them, of building stations, &c., on a magnificent scale, it will, *I believe, be found*, that the sum of £8,000,000 sterling would be quite sufficient to complete this submarine railway."

The manner in which this gentleman speaks of *throwing* into *deep* water, iron tubes a thousand feet long, capable of containing a full-grown railway, is perfectly refreshing. This extract gives no idea of his method of keeping them on the bottom after he gets them there. Another "project consists in crossing the English Channel, twenty-one miles in extent, by means of a tube made of strong plate iron, or cast iron, lined and prepared for that purpose; and which, placed at the bottom of the sea, should, besides the path for the surveyors, contain the two lines for the trains which would run within it. *The slope given to the submarine railway would admit of a motion sufficiently powerful to enable the carriages to cross the Channel without a steam-engine.* The greatest depth of the sea at the middle of the Channel will admit of the construction of inclined planes, by means of which the train would be enabled to reach a point where a stationary engine, or atmospheric pressure, *might* be employed in propelling the train to the level of the land railways of France and England. These tunnels beneath the sea would not prevent navigation. Two lighthouses might be erected at the entrances of the tube; also smaller ones between the lighthouses of France and England. These beacons should be lighted up at night, and would indicate outwardly the position of the submarine railway, so that mariners should not cast anchor near it, as the tubes might be damaged. The day and night lights of the lighthouses should be transmitted through the tube by means of reflecting metal plates. The upper part should have some strong glass windows, placed at equal distances, and gas, which would complete the lighting between the beacons. According to an estimate made, the cost *might* amount to *about* £87,400,000." This projector handles his finances as the other does his iron, in large masses, and with the same *nonchalance*.

The next does not place his tube on the bottom, but proposes "to situate it at a uniform depth from the surface by means of ties below (and *buoys* above if necessary), at suitable intervals. The continuation of the tunnel into the shore on either coast *I should dispense with;* and in order that it should have a partial freedom of motion, it should terminate with solid ends before reaching the shores. To these points chain piers should extend; or, if strict economy (say in the first instance), were aimed at in this item, the communication *might be by small steamers.*" As the tunnel or tube in question contains only a single line, the projector proposes "*pushing* one way, and *pulling* the other;" or, he says, "Electricity should, if at all practicable, be the motive power." After proposing, as the principle of construction, something "analogous to the cooper's craft," he continues, "when the tube was completed from end to end * * * favourable weather would be waited for, and the work of lowering would then be accomplished, nearly as follows:—The air-tight interior of each pontoon would be connected by an ample length of flexible pipe to an air-pump of adequate power, on board a vessel anchored at a distance corresponding to that intended for the mooring-weights. The two lines of vessels should be manned by steady men, each crew under a trustworthy leader. Athwart the vessels would be laid from the shore the wires of an electric telegraph, communicating with an apparatus on board of each, so that, at a preconcerted signal, the abstraction of the air from the pontoons should be commenced simultaneously at a given time, and carried on at a given rate. By this means the pontoons, gradually deprived of their buoyancy, would yield to the pressure of their burden, the buoyancy acquired by which as it entered its future element would be overcome by the weights with which, throughout its length, it was loaded, and which would speedily sink it to its prescribed depth. It would be when the tube reached the water that the mooring-weights, having been preparatorily slung under the vessels above-mentioned, would, at another signal by the electric telegraph, be *simultaneously let drop into the sea, and drag down their charge along with them.*" This project, which contem-

plates a tube not 1000 feet but 20 miles long, contains only a single way, and stops short of either shore, will cost £15,000,000, even with iron at £20 per ton; and yet, it goes more into detail, and is more complete as a whole, than any project on the tubular principle that has come under my observation. Whatever be its merits or defects, it fails to supply the great desideratum; it does not remedy the serious inconvenience which the immense increase of trade and travel in this direction renders daily more oppressive, viz., the necessity for employing three vehicles instead of one, in carrying goods and passengers between the capitals of the two countries. In a subsequent reference to his scheme, this projector says, "I am gratified by the opinion of a practical engineer regarding the practicability of the plan. I think it likely enough that the ironwork might be done for £16 per ton, but I chose to take a full figure:" surely, if £20 per ton is a full figure for a tube 20 miles long, consisting of seventy hollow staves of a peculiar and difficult sectional shape to make, £25 must be an extravagant estimate for plain tubes in manageable lengths, as I propose to make mine.

The proposer of the arched roadway, or tunnel *on* the bottom, will, with 40 subaqueous boats (of which he is the inventor), 1,500 sailors and navvies, 4,340,000 cubic yards of material, and £10,000,000, undertake to construct a tunnel by means of which the Straits can be crossed in thirty-three minutes; and he of the mammoth bridge will make in the Channel 190 pedestals, 300 feet square at the bottom, consisting of rocks bolted and lashed together, gradually rising at an angle of 75°, till they form each an insular plain, 150 feet square, 40 feet above the level of the sea; on these, build towers 100 feet diameter, 260 feet high; and crown the whole with a tubular bridge 50 feet deep and 30 feet wide.

When I began to devote attention to this subject, the extent of my knowledge of previous projects was derived from a humorous article in *Chambers's Journal*, entitled "The Channel Bridge," in which the writer notices De Gamond's tunnel and the Mammoth Viaduct. I had not then heard of any tubular proposition; and