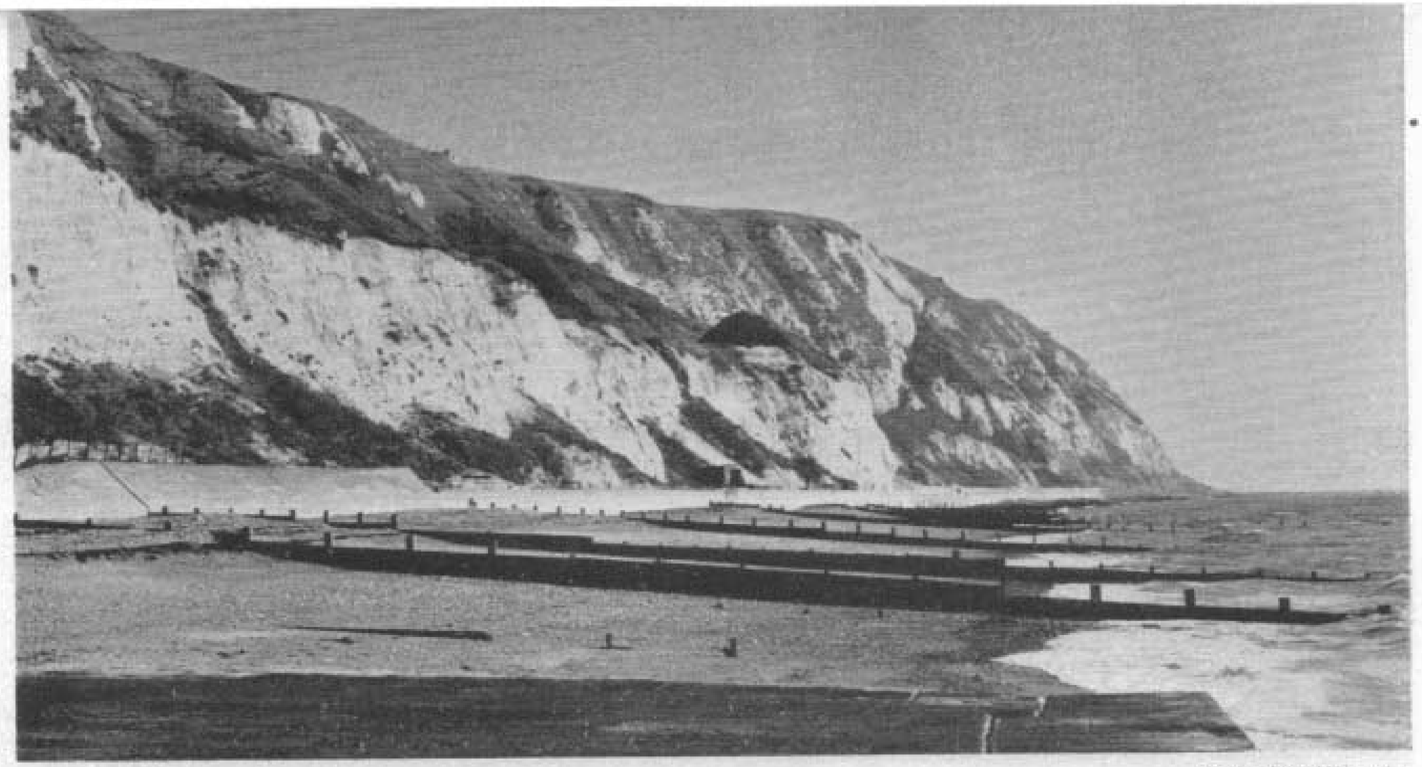


Photos: John Mannering

Abbots Cliff, between Dover and Folkestone. The entrance to the test tunnel, driven in 1881, is situated in the middle distance

UNDER THE CHANNEL

JOHN MANNERING

Now that the Government has decided on a Channel Tunnel, it is not without interest to recall what has already been accomplished since the project was first discussed in the early 19th century.

THE Channel Link has been a periodic source of interest whenever any pronouncement has been made by the Governments of the two countries concerned, or by various interested parties. There have been suggestions ranging from a tunnel under the sea bed to a dam across the entire Dover Strait. In between, there are the alternative schemes for a bridge, or a tube laid on the sea bed.

After extensive investigations of the rock strata of the bed of the Channel in recent years, and long deliberations on the engineering problems involved, a full report was recently studied by Her Majesty's Government and, together with the French Government, a decision has now been taken in principle to implement the project. Formidable obstacles—legal, technical and financial—still have to be surmounted, and construction itself will take up to five years. However, harbour and shipping interests concerned with cross-Channel traffic can now consider their future programmes, and those who have business interests with the Continent are now aware of the policy for the future.

The tunnel (or immersed tube) scheme has been agreed on, but the decision to go ahead was not an easy one to take. Air travel has increased in efficiency, and freight charges and facilities are undoubtedly becoming increasingly attractive. There is the hovercraft in the offing which, although still an unknown proposition from the commercial angle and, in fact, by no means proved as a satisfactory means of transport over rough seas, may, with the improvements which always follow new inventions, yet turn out to be the ideal marine transport of the future.

But a physical road or rail link, capable of passing an immense amount of traffic without the inconvenience and delay of shipping and unshipping, often in wild weather, for a mere 21-mile sea passage, has long been the dream of many engineers. A tunnel or a bridge seemed to be the two alternatives worth considering.

Many favoured a bridge. Certainly a link which allows cars to be driven over as easily as they pass along a modern motorway appeared to be attractive, while rail transport and, perhaps, even cyclists could have been accommodated. But the bridge had a number of disadvantages, of which not the least is the vast cost. Maritime interests were concerned with the possible interruption and danger to shipping, and there are many days in winter when a crossing over the bridge might have been a rather unpleasant journey for a motorist. But ever since a Frenchman, Thomé de Gamond, in 1857, proposed a bridge between Calais and the cliffs near Dover, the dreamers have clung to the idea, and certainly the great spans of a Channel bridge striding across the Dover Strait would have been one of the world's wonders. In addition to being a creation of great beauty for all to see, it could have accommodated a far greater flow of traffic than the less spectacular tunnel burrowing under the sea bed.

Now that a waiting Europe is aware of the decision taken, let us look at what has already been achieved.

A Channel tunnel has been in men's minds since the early years of the 19th century. In 1802 a French mining engineer, Monsieur Mathieu, presented a scheme for a tunnel to Napoleon Bonaparte, but perhaps the Emperor thought he had better first conquer the English before he attempted a permanent link between the two shores.

This was followed in 1859 by another proposal to drive a tunnel from the cliffs near Folkestone to Cap Gris Nez. This was also an idea of de Gamond's, which had the support of Brunel and Robert Stephenson.

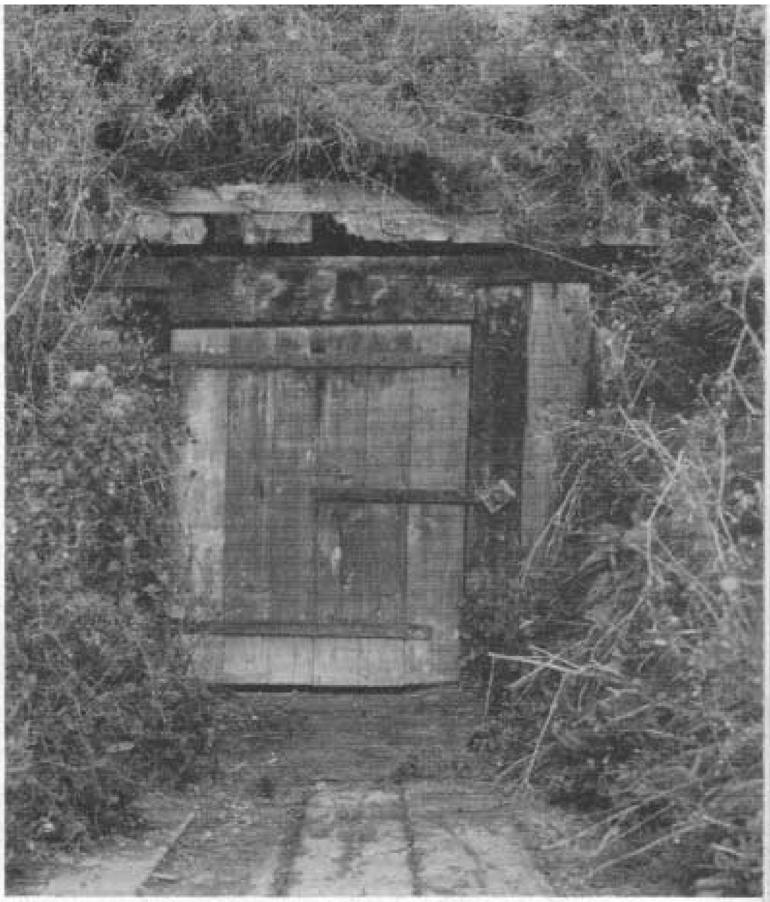
By the end of the century very definite steps had been taken. The tunnel had in fact been started from both shores, and it was only the decision of the Government, in 1882, to prohibit further work on political and military grounds, that prevented what would probably have been a successful, if rather long drawn out, completion of this very bold project.

In 1876 French geologists, by taking some 7,600 samples of the bottom of the Channel, had established that the lines of outcrop of the strata of chalk—which are evident in the cliffs on both sides of the Channel and have a north, or north-easterly dip—appear on the sea bed in a line lying parallel to a line between Folkestone and Sangatte.

In this chalk there is a sub-strata known as the Lower Grey Chalk, some 85 ft. thick, which also dips in a gradual decline from the English coast, under the sea bed, and reappears in the cliffs on the French shore. It was through this bed of impervious, flintless chalk, comparatively easy to work and possessing the peculiar property of slowly "puddling" itself and remaining impervious, or nearly so, after working, that it was suggested the tunnel should be driven.

On the strength of the geologists findings the French Channel Tunnel Company was formed. Its engineers sunk a shaft at Sangatte, near Calais, to the level of the Lower Grey Chalk, and an experimental tunnel was driven for a mile and a half beneath the sea.

In 1881 the South Eastern Railway Company, having obtained powers under an Act of Parliament, commenced experimental boring between Folkestone and Dover. A shaft was sunk at the foot of Abbots Cliff, a great bluff of chalk three miles west of Dover, and a tunnel was driven for half a mile in an east-south east direction. This was an experimental tunnel to test the boring machine, and the particular site was chosen because here the strata of Grey Chalk is at sea level and easy of access.



The railway drainage heading, kept securely bolted, which leads into the half-mile-long test tunnel which was bored in 1881 by the Beaumont machine

The Whitaker boring machine as it was left at the mouth of the 400-ft. tunnel in 1921. This view is from the back of the machine, the cutting head remaining buried in chalk

The machine used was designed by Colonel Beaumont. It was driven by compressed air, and had a cutting head 7 ft. in diameter, turning at eight revolutions per minute. It took off a $\frac{3}{16}$ in. shaving of chalk at each revolution, but the rate of boring, because of maintenance and shifting the position of the machine, was only some 40 ft. every 18 hours.

The fascinating thing is that this tunnel is still in good condition today, and only recently the writer had the good fortune to enter it. The surface of the 7 ft. circular tunnel is as smooth and clean as the day it was cut. It is completely unlined (the eventual rail tunnels, one for each track, would, of course, have been steel lined and grouted with cement) and only in a very few places has water entered. Where this has occurred, a growth of stalactites has begun and small, hard, creamy-yellow drip-shaped growths hang down about a quarter of an inch long—the beginnings of what would become, after untold ages, similar to those seen in the caves at Cheddar and elsewhere, but on a smaller scale, where water percolates slowly through rock.

The tunnel is under the care of British Railways engineers, and is now connected with one of the drainage headings under the main railway line running along the foot of the cliff.

Going along the tunnel one realised acutely the persistance of man's efforts, and the thought that eighty years ago it was the scene of bustle and activity at the commencement of a vast undertaking filled one with admiration for those old engineers.

Colonel Beaumont's machine, having proved its worth, was moved to a position just east of Shakespeare Cliff, where a shaft 160 ft. deep was sunk, to the level of the Grey Chalk (because of the dip in the strata, of about 1 in 50, the further north-east one begins operations the deeper one has to go to find the impervious strata).

The Beaumont borer was safely lowered down the shaft and for a period, in 1881-82, the first actual boring of a Channel tunnel went steadily ahead. This tunnel would in all probability have eventually been used as a drainage tunnel for the two main rail tunnels. As these tunnels would inevitably accumulate a certain amount of water, and as their lowest point would have been in mid-Channel, pumping would have been most difficult. It was intended, therefore, that the pilot tunnel then being bored should be beneath the main tunnels, declining from the centre to each coast, where water led into it from the main tunnels could be more easily removed.

This tunnelling way back in Victorian times, a period when England carried out a number of very fine and imaginative engineering undertakings, was going well ahead and had reached some 2,300 yards out to sea (in the neighbourhood of the end of the Admiralty Pier at Dover) when the Board of Trade stepped in and stopped further work.

Shortly after, a full Government enquiry heard evidence from the tunnel promoters, military experts and others, but permission to resume boring was not granted. A coal mine was later started in the vicinity of this tunnel and, as a result of an accident at the workings, the tunnel became flooded. In 1903 it was reluctantly decided to fill in the shaft, and the inundated tunnel which had been the beginning of a brave attempt to link England and France by rail was abandoned. The tunnel on the French coast had also been flooded for many years, but in 1959 it was pumped out temporarily to allow members of the Channel Tunnel Study Group to inspect it.

In 1913 a further big effort was made to obtain official sanction to recommence operations, but this was thwarted by the first world war of 1914-18.

In 1921 interest was again revived, and the South Eastern & Chatham Railway tried out a new electrically-driven Whitaker boring machine. It also chose a site in the Grey Chalk, but nearer to Folkestone, where the strata is some 150 ft. above sea level. This machine had a 12 ft. bore, and successfully drove a 400 ft. heading into the cliff at about twice the rate of progress of the old Beaumont machine. This was done in connection with yet another attempt to persuade the Government to allow the scheme to go ahead. But after prolonged negotiations it was turned down in 1930. The project was abandoned, and so was the machine! It was withdrawn to the mouth of the tunnel, where it remains today. The roof has fallen in, and only a portion of the machine is visible. But it is another fascinating relic of the long story of man's attempt to bring about a solid physical link between the two countries, and although it is not possible to estimate the final engineering problems in their entirety, it does seem that Government reluctance to this country being joined to the Continent has been the main difficulty.

Today's project is on a different scale and, while opinions may differ on the best method and siting for driving the tunnel, with the engineering brains of the mid-twentieth century the problem contains fewer imponderables than faced the pioneers 80 years ago. Yet they went boldly ahead, and who is to say, if they had been allowed to continue, that the tunnel would not have been completed many years ago, and would by now be a very welcome and accepted link in our communication with the mainland of Europe?

A further intriguing project was that put forward by an American syndicate in 1906. It was proposed to tunnel under the Bering Straits and form a rail link between Alaska and Siberia. It would then have been possible to board a train in London and travel all the way to New York, without necessarily getting out of one's carriage! This idea had first received publicity in the latter decades of the 19th century, and when Edward VII, then Prince of Wales, opened the Forth Bridge in 1890, the Inauguration Programme showed a picture of "events to come", with a sleeping car bearing the inscription "Through Carriage, Aberdeen, London, Dover, Channel Tunnel for Paris, Berlin, St. Petersburg, Alaska, and Canada"!

Truly the engineers of the last century were not without vision. Now, in our time, we can bring at least one of their dreams to reality.