

# THE STORY OF BREMONTIER,

*And the Reclamation of the Sand-Wastes of Gascony*

## ADDRESS TO THE WORKING CLASSES.

BY G. V. POORE, M.D.

IN the short address which I have the honour to give to you this evening, I purpose to bring before you the chief facts of a great sanitary work which has been accomplished by our friends and neighbours, the French.

If you will take the map of France and look at that portion of the coast which skirts the Bay of Biscay, you will notice that two great rivers flow into the sea along this coast. One, the most northerly, is the Gironde, a stream which has upon its banks the great commercial City of Bordeaux; the other river is the Adour, the mouth of which is 150 miles south of the mouth of the Gironde.

Between the mouths of these two rivers the shore of the Bay of Biscay is formed absolutely and entirely of sand, and for a considerable distance inland from the coast the soil of France is composed of sand. It is to this great sandy district, covering nearly two millions and a half of acres, and known in France as the Landes or Moorlands, that I wish to direct your attention.

These Moorlands have been the despair of agriculturists for centuries, and have been universally regarded as among the dreariest and most unwholesome districts in Europe. Sand has not the reputation of being a very profitable soil to the agriculturist, and in addition to the natural poverty of the soil the farmer in this region has had to contend with the impossibility of efficient drainage. The Landes formerly produced nothing

except a scant herbage sufficient to support a few miserable sheep, tended by shepherds as ill-favored as their flocks, who generally suffered from one or other of the many diseases prevalent in the country; for disease was about the only crop which the Landes formerly brought forth abundantly.

Indeed, you will find that plains which are unproductive are generally unhealthy. The Campagna round Rome is a very hot bed of malarious and other diseases, and the sandy plains of Holland, and our own Lincolnshire enjoyed a similar evil repute, before efficient drainage was brought about by skilful engineers, and the cultivation of the soil became possible. Husbandry and disease are sworn foes, and the pursuit of agriculture is generally the pursuit of health, and a healthy man is generally contented. Here is an argument for "small holdings," for "three acres and a cow," and for "allotments," which I freely give to those who find pleasure in political contention.

The drainage of the Landes presented special difficulties, and difficulties which no engineering skill and no expenditure of money in the direction of bricks, mortar and machinery, seemed likely to overcome, and for the following reasons:

The reputation of the Bay of Biscay is familiar to every Englishman. It is there, if anywhere, that the force of wind asserts itself, and the winds are generally westerly in direction, and blow with fearful violence from the sea over the land.

The shore of that part of the bay with which I am dealing, is composed as I have said of unmitigated sand. The effect of the wind upon sand is familiar to all of us, for the sand is borne before the wind and travels considerable distances.

Now, in the Bay of Biscay the rise and fall of the tide is great, so that the sand washed up by the sea is left high and dry to the extent of many feet at low water.

Again, in the latitude of the Bay of Biscay the sun is far more powerful than here, so that in the interval between the times of high water the sand is greatly heated by the sun, and is so thoroughly dried that the particles no longer tend to stick together—glued by natural moisture,—but are easily driven before the furious blast which comes roaring from the sea. When the wind is not very strong it blows the sand into heaps along the shore. These heaps or hills may reach an elevation of from 60 to 300 feet, with an inclination of about 30 degrees towards the sea. These heaps of sand are called "dunes," a word having the same origin probably as the English "down," and formerly the whole fore-shore of the Bay of Biscay, between the Gironde and the Adour, presented an undulating appearance, as though a portion of the swelling, rolling sea had

been turned to sand and become stationary. If these sand-hills had been really stationary they would have formed a natural rampart against wind and waves, and it might have been possible to drain and cultivate the land behind them. But this was not the case. The scanty herbage of grass and reed which grew upon the dunes was not enough to fix them. It only required a gale of moderate force to completely alter the face of the country;—hills became flat, valleys were filled up, the lakes which formed behind the dunes became dry land, the water which the lakes contained was forced in some new direction, and what happened to the lakes also happened to the water courses, with the result that the whole country was water-logged, and fields and gardens which had been painfully and industriously cultivated were submerged by the drifting sand. It is even stated that villages disappeared completely in this way, and that the enterprising agriculturist in digging his estate was liable to the surprise of finding just beneath the surface the brazen weather-cock on the steeple of some long forgotten parish church. It is a great labour, even at the present day, to keep the mouths of the Gironde and the Adour free from drifting sand, and it is certain that a century or so ago the course of the Adour was completely changed, owing to the channel getting dammed by sand blown into it. If an accident such as this could happen to a mighty stream like the Adour, one may judge of the great uncertainty which attended the course of smaller streams, and the absolute impossibility of draining the land.

A few feet below the average level of the surface of the district there is an impermeable stratum, locally known as *alios*, which keeps the water from flowing away, and beneath the impermeable stratum is more sand sodden with undrinkable water.

The result of this condition of things naturally was that the district of the Landes during the wet season was a swamp, and during the dry season a pestilential morass. The district was uncultivated, and produced nothing but scanty herbage, which served as pasture for a few wretched sheep, tended by shepherds doomed to spend their lives upon stilts, for the country was such that it was impossible to walk far in any one direction without sinking to the waist or shoulders. The country produced no corn and the population was the scantiest in proportion to acreage of any district in France. The population was kept down also by disease. Fevers of all kinds—and especially those of a malarious type—were exceedingly common. And in addition, there was a disease peculiar to this and a few other districts in Europe, known as Pellagra; a

terrible disease which disfigured and slowly killed; the patient dying with the aspect of a mummy and the mind of an imbecile.

The Landes had remained for centuries as a hideous blemish on the fair face of France, and all attempts to reclaim and cultivate them had signally failed. The Emperor Charlemagne, it is said, employed his troops in the intervals of his Spanish campaigns in an attempt to reclaim the Landes, but the forces of nature laughed at the puny opposition of the greatest magnate of the world, and at once resumed their sway as soon as the imperial soldiers had ceased to dig ditch and throw up bank.

I have no fear of being contradicted, when I say that it is of no use to attempt to fight with Nature. We may oppose her for a time, but only for a time. In the end she asserts her sway, and man sees too late how his labour has been in vain.

Dwellers in these Islands do not need to be reminded of the awful and irresistible power of wind and wave, against which the mere dead weight of cyclopean breakwaters, constructed at gigantic cost and maintained by constant periodic expenditure, is at times laughably impotent. I need not say that the wind and waves of the Bay of Biscay are the roughest and rudest in the world, and that if the maintenance of dead breakwaters is an endless and almost hopeless task on our coasts, on the stretch of coast which I am considering their construction and maintenance would be alike impossible. Thus it was that until the latter end of the last century the condition of the Landes, a tract of two millions and a half of acres, seemed hopeless, and they seemed doomed to be open to the fury of sand storms for ever, and to remain a pestilential, unprofitable, undrained swamp to all eternity.

But, happily for France and especially for the dwellers between the Gironde and the Adour, there was born in 1738 Nicolas Theodore (or Thomas?) Bremontier. It is said that the world knows nothing of its greatest men. Certain it is that Bremontier was one of the greatest benefactors to humanity that the world has ever known, but I regret to say that I can tell you very little about his life.\*

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\* By the kindness of Mr. Jenkins, the Secretary of the Royal Agricultural Society, I have been enabled to obtain from Paris the following extract from the memoirs of the Agricultural Society of the Seine. This short biographical notice of Bremontier is from the 13th volume of the Transactions of the Society (for the year 1810), and has been most courteously extracted by M. Laverriere, the Librarian:

"Nicolas Thomas Bremontier was born at Quavilly, near Rouen, July 30th, 1738, and soon manifested great aptitude for the exact sciences. He was very young when he entered the school of the '*Ponts et Chaussées*,' and at 18 he went to the College of the Marine Artillery at Toulon, to teach applied mathematics. This school, established by M. Choiseul, was broken up a few years later, and Bremontier went as Engineer of Roads and Bridges, first to

Bremontier recognised the fact that the only way to grapple with the forces of Nature is, not to fight blindly with them, but to try to make use of them. Nature is always working for our benefit, and although it seems as though at times in a fit of anger as it were (the real object of which we may fail to comprehend) she destroys much of her own work, still, in the long run, those who endeavour to turn the forces of Nature to account will find the balance enormously in their favour.

It is well known, and has been long recognised, that the best protection for a bank or rampart against the fury of the elements is to plant it. A loose heap of earth is liable (no matter how huge it may be) to be washed and blown away in times of tempest. If, however, the bank be planted, the roots of the trees and plants hold the elements of the soil together, and the spreading branches and leaves form at the same time a protection from the fury of wind and water. It is true that even planted hills and banks may suffer severely in times of exceptional storm, but the storm once past, the

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Perigueux, and then to Bordeaux. Here he was actively engaged in his profession, and published papers on the drainage of marshes in the neighbourhood of Bordeaux, on the cleansing of the Bordeaux harbour, and on the methods of restraining rivers and torrents to their proper beds. His energy was inexhaustible, and in his leisure he taught himself the principles of music and became in this direction most efficient. Promoted to be Inspector of Roads and Bridges, he went to Brittany to make a canal to join the Rance to the Villaine. Thence he was sent to Normandy to make a canal from the Orne, by Caen, to the sea. At Caen, he reconciled the differences which had arisen between the provincial magnates and the officers of the Ponts et Chaussées, and his judgment and conciliatory spirit had proved useful in a similar way in Bordeaux. When, therefore, the post of Engineer in Chief for Guienne became vacant, he was appointed in obedience to the wishes of the locality.

"Bremontier joyfully accepted this post, not merely because it was at once a professional and social promotion, but mainly because while formerly living at Bordeaux he had been a witness of great troubles for which he believed he had found a remedy; at least his early experiments (conducted at his own cost) gave him a strong cause for hope. Bremontier felt that here was to be the theatre of his greatest and most useful labours. Possibly, we might believe, he thought to earn an unperishable fame, for self-interest, we are prone to think, is the main spring of good works. Bremontier had less need of such a spur than most men.

"He had visited the sand hills of Gascony during his first sojourn at Bordeaux, and bewailed the misery caused by those moving mountains thrown up by the sea and driven by the west wind, which had already smothered a vast tract of cultivated land, as well as rural inhabitants and villagers, and threatened to cover the more fertile districts and advance even to Bordeaux itself.

"The idea of arresting this devastating power took possession of Bremontier, and the hope of success occupied entirely his brain and hands. He studied the nature and the movements of the sand, he measured their extent, and noted the ravages past and to come.

"He recognised their vegetative power, and from the year 1787, he knew that a great number of plants and especially resinous trees could find nourishment in them. He made experiments at his own cost to get some definite

silent forces of nature commence at once the work of reconstruction; the damaged roots send forth fresh rootlets, the damaged branches soon push again with buds of promise, and possibly before the advent of the next exceptional gale, the storm rampart is stronger than before. These silent forces of nature are truly beneficent; they merely ask for fair play, they work for us without wage, and one great principle of success in all work in this world, be it legislative, be it sanitary, or be it of any other kind, is to go with them, not to fight against them; to learn if we can what is nature's inexorable law, and lay to our hearts the fact that nature brooks neither stubbornness nor disobedience.

Bremontier recognised the fact that the only way to fix the drifting sand-dunes was to plant them: but how and with what? These were the questions he had to solve. Sand is not regarded as a promising soil by agriculturists in general, and the sea-sand along the shore the least promising of all. And yet sand must contain in its interstices a good deal of organic matter left by the seaward-tending rivers, and the fact that the sandy estuaries

facts. He perfected his method of procedure, and at last, certain of success and feeling that such an enterprise was beyond the power of a single man, he sought the help and succour of the Government. His assertions were not credited, and his project shared the fate of many other creations of genius which are repelled at their birth by the ignorant, until the results become so numerous and evident as no longer to be neglected.

"After Bremontier's first attempt the solid basis of procedure was found, and the extension of his work alone was necessary. What proportion was there between the few acres planted at the cost and by the care of one man, and that vast stretch of country extending from the Gironde to the Adour, nearly 180 miles and averaging 3 or 4 in breadth, all exposed to the action of the destructive sand and in part covered by it?"

"During his second residence at Bordeaux he renewed his application to Government, this time still more certain of the success of his project.

"In a short notice like this it is not possible to enter into all his trials and difficulties, nor to dilate upon the dangers to which he and his works were alike exposed during the period of anarchy to which France at that time was so long a prey.

"The genius who then controlled the destinies of the Empire appreciated the value of Bremontier's projects, and in the year 1801, he allotted 50,000 francs for the continuance of the work, and a similar sum has been allotted to it in each succeeding year.

"Bremontier now began to enjoy the fruits of his labour, and in 1808, 3,700 hectares of land (about 9,000 acres) had already been sown. Honoured by the esteem of the department of *Ponts et Chaussées*, he had been promoted to the rank of Inspector-General, and he was chosen by his fellow citizens of Bordeaux to be one of a deputation to wait upon the Emperor at Bayonne. He had then the happiness to submit to this great ruler his future projects and his past success, and felt assured that from that time the great work to which he had devoted himself would not be abandoned, and that its future success was assured. The fixation of the whole of the Dunes is now ranked among the great public benefits to which Napoleon with the instinct of a genius gave his support. Bremontier in his dying hours was doubtless consoled by this pleasing prospect, and he breathed his last surrounded by his friends, and with the calmness and resignation of a true philosopher."

of rivers are very liable to breed malaria may be taken as evidence that organic matter must exist in quantity and in fine division among the minute particles of sand. This spring I was astonished at finding, close to Biarritz and within a few yards of the sea, a very flourishing crop of peas which had been sown in the sand without, apparently, the admixture of any manurial body. They were protected from the sea-winds by hurdling made of gorse, and enjoyed an ample exposure to the sun, and thus bid fair to yield a good return in due time. The pea is a plant that sends its roots very deeply, and the roots doubtless found moisture and nourishment at a great depth below the surface. For fixing dunes, however, something more permanent than peas is necessary, and Bremontier resolved to try the *Pinus Maritima*, a species of pine-tree which was known to flourish in sandy soils near the coast. The *Pinus Maritima* is a species of *Pinaster*, and in habit and size it very much resembles the common "Scotch Fir," with which you are all familiar. Bremontier made his first sowings of the seeds of *Pinus Maritima* in the year 1789, and I will state shortly his perfected manner of procedure by which he overcame the obvious difficulties of his task.

I wonder what the dull-minded and prejudiced peasant thought of this enthusiast who went forth to do battle with the mighty ocean and still mightier wind, armed only with a few handfuls of pine seeds such as might be driven far away by the first strong gust that blew. I wonder also if only the ignorant laughed at him, and if he escaped the jeers and sneers of those who had enjoyed the advantages of a better education. Probably not, and equally probably he cared little for the opinions of the prejudiced. The pine seeds were sown mixed with seeds of the common broom, and the sowings were made in a direction at right angles to the prevailing wind. A screen of hurdles made of gorse or of planks deeply driven into the sand was placed on the windward side of the seed-ground, and the seed-ground itself was thatched with pine branches and other suitable material. At the end of the first year the broom would be 9 or 10 inches high and the pine saplings only 2 or 3 inches, and thus the tender little saplings were nursed and protected by the plants of broom. In half-a-dozen years or so the brooms had reached their full growth, but the pines continued to grow, and, in course of time, overtopping the brooms smothered their nurses, and being themselves judiciously thinned and pruned by the foresters, grew into fine trees able to resist the fury of the elements, sending their long tap-roots and laterals in all directions through the dunes, and causing them to become year by year a stronger and stronger protection to the inland wastes instead of a dangerous menace. Before



the dawn of the present century Bremontier had proved the success of his practice, and in the year 1801 the matter was taken in hand by the French Government, and in 1810 it was ordained that so much of the sand-dunes as belonged to the State should be planted after the manner of Bremontier, while the private property of those who were unwilling or unable to plant should be taken in hand by the State, all revenue arising from such land being confiscated until the cost entailed by the work had been recouped.

In 1817, a yearly sum of less than £4,000 was voted for the reclamation of the dunes and wastes of Gascony, the result of this has been that in the department of Landes, 98,000 acres of forest have been planted, and that whereas in 1834 there were about 900,000 acres of uncultivable land in the department of Landes alone, there are now only 340,000 acres, showing that in the past half century, reclamation has proceeded at the rate of 12,000 acres a year. These figures apply only to the department of the "Landes," and leave out of consideration the department of "la Gironde," in which, however, nearly half these waste Moorlands are situated. This reclamation has been made possible by the fixation of the dunes, which has rendered systematic drainage operations practicable; canals and drains have been cut in every direction, and, thanks to the pine forests, there is now no longer any risk of their being choked up with sand.

The *Pinus Maritima* has proved a very profitable tree, and within twenty or twenty-five years of sowing, it began to yield a return. The timber is of very moderate quality, but is largely used for packing cases, as shores in the dockyards of Bordeaux, for railway sleepers, and for fire-wood. I may remark in passing, that the great scarcity of coal in France compels the French to look to their forests for fuel, and there is probably no nation more clever and more thrifty in the management of trees.

The pine trees are chiefly valuable for their yield of turpentine and resin, which in that comparatively warm climate is very abundant. The resin is obtained by removing a strip of bark from the tree and allowing the exuding sap to trickle into a small earthen vessel shaped like a flower-pot. The trees begin to yield resin when they are about twenty years old, and the resin is worth about £5 a hogshead in its raw crude condition. As far as I am able to judge, it requires about 250 trees on an acre of ground to give a hogshead of resin. It requires comparatively little labour to collect the resin, so that the profit per acre from the resin harvest is considerable. It is said that the draining away of the resin does not seriously



affect the value of the timber. Besides resin and timber, the manufacture of charcoal is largely carried on, charcoal, as you are aware, being in great demand in France for a variety of purposes.

Thus it appears that the waste moorlands on the shores of the Bay of Biscay have become of great commercial value. Journeying from Bordeaux to Bayonne the railway passes through one long monotonous pine forest. When I state that the journey takes between four and five hours you will be able to judge of the vast tract of country which, once the abomination of desolations, is now covered with millions of the resin yielding *Pinus Maritima*. The cultivation of the pine improves the soil, which is gradually enriched and altered in quality by the dead leaves and other vegetable *debris* which fall upon it. In some places clearings have been made in the forest and vineyards planted, and I need not remind you that the most valuable vineyards in the world are on the southern bank of the Gironde on the very fringe of the pine woods which I have been describing.

The rise in agricultural value of this tract of country, great as it is, is a small matter. The great gain after all has been the rendering wholesome of a pestilential swamp and the removal of a plague spot from the face of Nature. The Shepherds of the Landes, except in very few places, have now no longer any need to walk about on stilts, and Malaria and Pellagra from being common have become rarities, and will soon become extinct. Life in this district no longer languishes and ends prematurely, but the dwellers of this vast district enjoy a vigorous health, and that happiness and contentment which vigorous health alone can give.

Population has increased very rapidly since the beginning of the century, and industries of various kinds are able to be carried on. Round the basin of Arcachon is a very large population supported mainly by the oyster fisheries, and the town of Arcachon which has grown up in the pine forest is one of the best known health resorts in Europe, where land in the best situations is worth about £1,000 an acre. Well may the dwellers in Arcachon raise a statue to Bremontier, whose far-seeing and thrifty policy has brought them health, happiness and riches in place of disease, misery and poverty.

I have now given you the simple details of the manner in which Bremontier's small beginning has made great end; how his pine plantation, made at first with no little labour and sorrow, began along the coast, and with the lapse of a century has reclaimed a province.

You will be asking, perhaps, why I have chosen this subject

for my short address to the inhabitants of York, and having listened to my tale, you will be asking for the moral.

I chose this subject for my address for several reasons. The chief reason probably is to be found in the fact that I spent part of the early spring of this year in the district which I have been describing, and what I saw there made, as it could not help doing, a very deep impression upon me.

My next reason was that it is an aspect of sanitation which is not often dealt with at meetings like this, and I was glad of the opportunity of taking you away from pipes, traps, sinks, and those expensive roads to health which we have to consider in cities, to contemplate the sanitary effect of good husbandry in the open-air; and to show you on a large scale what I believe to be universally true, viz., that the cultivator of the soil must always be the right-hand man of the sanitarian.

It has been refreshing for us to contemplate a sanitary work which has been a financial success. Sanitation always gives us the best of all dividends—health. And it is a short-sighted policy, especially in cities, to look for a money return on the capital expended on works for improving the public health. The thrifty French, however, have given to the world a valuable example of a comparatively small expenditure yielding *in the course of time* a magnificent return of both health and material prosperity.

Do not run away with the idea that the *Pinus Maritima* is a cure for all waste lands, and unwholesome districts, because it happens to be especially suited for the soil and climate of the eastern shores of the Bay of Biscay. In the warm climate of the south it yields abundance of resin and turpentine, grows quickly, and furnishes a large quantity of timber. In more northern climates it will grow, but does not flourish; and although there is at least one fine specimen in Kew Gardens, it is not, from all I have heard, a tree suited to this climate.

My story seems to show that in the reclamation of waste lands we must not be in a hurry. Nature is sure, but from our point of view, slow. Bremon tier, and those who worked with him, began in a small way. We may be sure that experience had to be bought at more or less expense, and it was not until the success of his methods had been proved that the French Government seriously took the matter in hand. Bremon tier was a true patriot. He worked solely for the good of his country and for posterity. He had no idea of immediate profit, either for himself or his contemporaries. He drew his modest salary as inspector general of roads and bridges (for he was an official of the state department of "*Ponts et Chaussées*"), but looked to no further profit. He lived barely long enough to see

the resin flow from his first plantings. He pointed out, as it were, the way to the promised land, but, for himself, he only saw the promised land "in his mind's eye." It is good for us to bear this fact in mind, for many reformers of the present day seem, in questions of land management, to look only for immediate results, and to be actuated by the not very noble sentiment of "bother posterity, what has posterity done for me?"

There has been a good deal of talk of late about the reclamation of waste lands in this country, and the opinion of some seems to be that worthless soil presents a glorious opportunity of wasting money. These are questions concerning which I cannot speak to you as an expert, but it seems certain that the problem of reclamation must differ with the circumstances of soil and situation, and that it is far more easy to do the wrong thing than the right. The first thing necessary is to find a Bremontier to show the way. We shall want a Bremontier to show us the way out of the pestilential quagmire which we Londoners are making by dint of large expenditure in the estuary of the Thames. We want a genius and enthusiast who will do for the bogs of Ireland what this great Frenchman did for the Landes of Gascony.\*

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\* For many of the facts embodied in this address I am indebted to Dr. John Croumbie Brown's "Pine Plantations on the Sand-wastes of France." Edinburgh (Oliver and Boyd, 1878).