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copied from hangings and other textile fabrics. Esarhaddon, describing the building of his palace on the Nebbi Yunus Mound at Nineveh, says, "I embellished the ceilings of the apartments with veneers of ivory and alabaster, and the walls I covered with plates of pure silver and bright copper, and with embroidered hangings." Now the word used in all the Assyrian inscriptions for the verb "to embroider" is *rakam*, which is not only retained in Hebrew and Arabic, but reappears unchanged in the Spanish and Portuguese *ricamare* and the French *recamer*, "to embroider." The past participle of the Arabic *rakam* is *markum*, and *markum* means a carpet throughout the north of Africa. In old Spanish inventories also we find the word *morgomes* used for carpets, particularly striped carpets. This etymology of itself carries the art of embroidery, and of decorative weaving generally, back to their archaic sources in the valley of the Tigris and Euphrates. The Chairman then proposed a vote of thanks to Mr. Cecil Smith, which was carried unanimously.

#### CANAL CONFERENCE.

Friday, May 11th, 1888. [Continuation of report.] Col. A. C. HAMILTON, R.E., Member of the Council in the chair.

#### SOME REMARKS ON THE CANALS AND INLAND NAVIGATION OF FRANCE, BELGIUM, AND HOLLAND.

By WILLIAM JOHN CHARLES MOENS, F.S.A.

An ever increasing foreign competition is pressing hard on the agriculture and manufacturing interests of this country. Handicapped by the products of silver and paper currency countries on the one hand, and by the free import of the surplus manufactures of Germany, France, and Belgium on the other, our farmers and manufacturers are at their wits' end. Their former natural advantages have been lost one after another, and the greater carrying power developed by vessels through compound engines and triple expansion of steam has reduced the freight of wheat from 10s., as estimated by Mr. Cobden, to sixpence a quarter, from America or India. As with corn, so with other goods. This cheap conveyance ends, however, with the port of arrival, railways charging for a very few miles the same amount as paid for conveyance from America. The determined and successful fight for cheap water conveyance to Manchester, the centre of our manufacturing districts, is drawing public attention to inland navigation. France, Belgium, Hol-

land, and Germany owe much of the great increase of their commerce to their admirable systems of canals and canalised rivers, which not only enables heavy traffic to be cheaply carried to the very doors of factories and to markets, but induces a wholesome competition on the part of the railways, and thus goods rates are maintained at a low level.

With but very few exceptions, our system of canals, with barges of twenty to seventy tons, has been on so small a scale as to be practically valueless. Locks of a size to pass one barge at a time cause delay when steam towage is used. A new departure is required, and we have to look abroad to see what can be done in the way of carrying heavy goods at a cheap rate on canals and rivers. As the much increased carrying power, and the development of the modern engines, have reduced so much the freight of foreign and colonial produce, so may we reasonably look for a similar reduction in the carriage of goods on canals by the use of larger barges and suitable steam-power.

Mr. Vernon Harcourt, in his able paper on "Canal Engineering," states that the tonnage on the 4,709 miles of navigable rivers, and 2,889 miles of canals in France, amounts to about 9,300,000 tons; and Mr. Jebb notes that, with depressed trade, the 162 miles of the Birmingham Canal alone had a traffic last year of 7,000,000 tons. This proves that there must be a great unsatisfied demand for canal navigation, which would provide ample traffic if suitable canals were made, and rivers canalised, to carry goods at a low rate.

It may therefore be useful to cast an eye on the foreign system of canals, which, from a very early date, were constructed on a scale undreamed of in this country.

In France the improvement of rivers and construction of canals has been encouraged and fostered by the State since the commencement of the 15th century, and indeed, some of the canals are of a much older date, having been made in the time of the Romans.

The comparatively modern use of railways has not diverted the attention of our neighbours, but greater encouragement has actually been given for the use of the navigable ways, in order that the general welfare of commerce might benefit by competition, the railway rates being thus kept down to a moderate price. Since 1879 vast sums have been expended in deepening and ameliorating the more important routes, all of which, with but trifling exceptions, are State property. The inland

craft, which are chiefly barges (called *péniches*) of about 270 tons, are all licensed and under police discipline; they belong, as a rule, to those who work them, though there are companies which own a number; those working these craft are very superior as a class to our bargees, and their wives and children live on board with them. Various insurance companies grant policies on these inland vessels and their freights at low rates.

Paris is the natural centre of the French canals; the barges find their way there from the ports of Dunkirk, Gravelines, Calais, and Havre, large quantities of coal, iron, and wheat being carried, and in the fall of the year the cargoes of numerous timber vessels are made into rafts and floated to their destination, but of late years the increasing quantities of planks and deals sawn in the North, are loaded into the barges. The important coal and iron districts of Belgium, at Mons and Charleroi, provide much freight for Paris, which goes *viâ* Condé from the former, and Landrecies from the latter, the two routes uniting at La Fere, whence the Seine, at Conflans, is reached by descending the River l'Oise. The River Rhine is communicated with at Saarbruck and Strasburg; Switzerland at Bâle, and the important ports of Marseilles and Cette by the Yonne, the Burgundy Canal, and the rivers Saône and Rhone. The western ports of Nantes, Brest, and Bordeaux have also canal communication with Paris.

Vast sums have been expended on these waterways by the State, amounting in the years from 1814 to 1870—1st, for extraordinary works, 746,209,000 francs; 2nd, for ordinary works, 427,006,000 francs; total 1,173,215,000 francs. Besides this sum, there are annuities (which expired in 1882) of 1,346,327 francs; others, payable to 1890, of 3,116,096 francs. Since 1870, notably from 1879, a further large liability has been incurred. It must be remembered that the greater part of these works were commenced before the invention of railways, and were then absolutely necessary for commerce, but since railways were in full working, and particularly of late years, the inland navigation has been immensely improved, for the very purpose of facilitating the conveyance of goods and heavy mineral traffic, by which commerce and the possibility of successful competition with other nations have been greatly benefited.

The large *péniches* of 270 tons, which are about 116 feet long, 16 feet beam, bluff at bow and stern, and almost flat bottomed, draw

1·80 metres when loaded; they are worked most skilfully by two men and the wife of the captain. The value of these craft, with their equipments, is from 10,000 to 15,000 francs, and they are always insured against damage or loss. In all rivers and places with the slightest risk, the use of pilots is compulsory.

The rules of the Administration for the guidance of barges are numerous and very stringent. The vessels are placed in five classes, according to which they are passed through locks, bridges, &c. Vessels propelled by steam take precedence of all others, but on many routes special permission for this class is necessary. Those authorised as *bateaux accélérés* have extra rules and privileges, and are allowed to travel by night. On the Seine, Saône, Rhone, and some other rivers, and certain portions of some canals, is found a very cheap and powerful method of towage by means of a submerged chain or wire rope, which the tug, or *remorqueur*, with steam power, raises from the bottom as it progresses, it being nipped between revolving pulleys, and when extra power is required, having three turns round an iron drum. The traffic on the St. Quentin Canal, through the Riqueval tunnel,  $4\frac{1}{2}$  miles long, is thus worked, and I have seen twenty-nine barges, each laden with 270 tons of coals, towed at a rate of about two miles an hour, by means of a small tug with engines of 20-horse power. It will be noted that the late experiment of towing barges of an aggregate weight of 100 tons, including their freights, by a locomotive engine, on rails laid on the tow-path, compares very unfavourably with the above system.

The locks on the more important routes all accommodate these 270-ton vessels, but in places with large traffic they are found 130 yards long, by 13 yards wide, to allow several vessels to pass through together. The hours of work, as a rule, are from an hour before sunrise to an hour after sunset.

In 1870, the freight by water for coals, with 75 c. more for coke, per ton, was as follows:—Mons to Paris, 235 miles, 7 frs.; ditto to Dunkirk, 140 miles, 4 frs.; ditto to Strasburg, 460 miles, 11 frs. 20 c.; ditto to Antwerp, 130 miles, 3 frs. 45 c. In 1868, 1,690,800 tons of goods, chiefly coals from Belgium to Paris, passed on the canalised river l'Oise. On the River Seine there were no less than 2,741,400 tons carried; on the River Schelde, from Cambrai to the Belgian frontier only, 1,175,600 tons,

and on the River Aa, from St. Omer to Grave-lines, 375,300 tons.

The Canal laterale à la Garonne and the Canal du Midi unite the Atlantic and the Mediterranean. The locks are 27 metres long, and 5·80 metres wide, with a depth of 1·60 metres. The height of the bridges, which are fixed, is 2·72 metres. A detailed account of a voyage through this navigation, in the steam yacht *Miranda*, was given by its owner, Admiral Lord Clarence Paget, K.C.B., in the *Journal of the Society of Arts*, April 14, 1882.

The average effective depth of the French canals is about five to six feet, with the exception of those routes lately improved, great attention having been bestowed on the waterways from Dunkirk and Calais. The River Seine, from Rouen to Paris, has a depth, except in times of drought, of six to seven feet, but works are now going on to increase this to a little over ten feet. The locks on this river are magnificent works, their dimensions being reckoned by yards instead of feet, so that they will accommodate vessels of 800 to 1,000 tons when the improvements are completed. The bridges are fixed in France, with the exception of a few in the extreme north, and are about 12 feet high, as a rule.

The works to be consulted on the subject of the French canals, are:—"Précis Historique et Statistique des Voies Navigables de la France," &c., par Ernest Grangez, Paris, 1855; "Les Voies Navigables de l'Empire Français," &c., par Alexandre Collin, Orleans, 1865; "Etude Historique et Statistique sur les Voies de Communication de la France," &c., par M. Félix Lucas, Paris, 1873; "Tableau des Rivières et Canaux (Annexe à la Circulaire, du 9 Mars, 1867, No. 1,055) Administration des Contributions indirectes," which gives the kilometric distance from place to place throughout France; and the annual reports and statistics of the Department.

The canals and navigable rivers of Belgium have a most important influence on the commerce and trade of that country. Very many factories have water-frontage, as in France, by which the raw material and the manufactured goods are cheaply carried. Both here and in the north of France, numerous barges, laden in the autumn with sugar-beet, are constantly seen where the sugar industry is worked.

It is probable that the making and using of canals in Belgium dates to a more remote period than in any other country of Northern Europe. A chronological list of details connected with these works was most ably given

by M. J. B. Vifquain, in his work on the "Voies Navigables en Belgique," Bruxelles, 1842.

The connection of the French canals with those of Belgium is—1. By Dunkirk, Bourbourg, and Furnes to Plasschendaële on the Ostend and Bruges Canal; this route has been lately very much improved and deepened. 2. By Cambrai and the River Lys to Ghent. 3. By Douai and the Schelde to Ghent. 4. By Condé and the River Dendre to the Schelde at Termonde. 5. By Landrecies, *via* Charleroi to Brussels, and also to Liège.

There is much traffic in the Upper Schelde from Antwerp to Ghent, the waters being tidal to the latter town, with a depth of six to eight feet, working the river with the tide. The most important ship canal is that of Terneuzen to Ghent, thirty-five kilometres in length, the lower portion of which belongs to Holland. This is used by some twenty steamers from England weekly, taking coals, pig iron, and other articles, and loading manufactured iron and other goods from all parts of Belgium. The inland harbour at Ghent has been much enlarged of late, and the lock there has been removed, thus rendering access more easy. It is now a magnificent waterway of ample depth and great width, with locks at Terneuzen on the Schelde, and at Sas van Gent, near the Belgian frontier; there is a pilot station at Terneuzen, the men taking their turns to and from Ghent. English coal may be bought for fifteen to eighteen francs a ton at Ghent, being carried at a very low freight for want of cargo on the outward voyage. Vessels of the following dimensions can use this canal:—Length, 110 metres; breadth, 11·50 metres; and draught, 5·85 metres. Their speed *en route* when exceeding 2·75 metres draught, 145 metres a minute; when under 1·50 metres draught, 250 metres a minute. These, with other regulations, were authorised by decree of 11th August, 1885.

The ship canal from Ostend to Bruges has fifteen feet of water, but a depth of seven feet only is found from the latter city to Ghent. There is some coal and local traffic on this system, but of no very great quantity.

The River Rupel, which is about twelve miles above Antwerp, leads from the Schelde to Willebroek, opposite the town of Boom. From here a canal with five large locks leads to Brussels. This canal, which had its origin in the year 1415, but which was only completed in 1561, is of much importance. The traffic on it is heavy, and it is worked by the

Corporation of Brussels, the result leaving a large annual profit. The tolls on this canal are—First-class, '06 franc; second-class, '04½ franc; third-class, '02 franc per ton; in all cases a cube metre is reckoned as 1,000 kilogrammes or a ton. In the first-class is reckoned merchandise, &c.; in the second-class, bricks, firewood, stone (wrought or unwrought), salt, &c.; and the third-class, unladen vessels.

There is a depth of from somewhat over 10 feet of water, but this is limited to an effective depth of 3'10 metres where it passes over a small stream by a brick aqueduct. A line of steamers belonging to Messrs. Thomas & Co., of London, runs to Brussels regularly, and several Dutch lines of steam barges use this route. Sailing vessels and lighters are worked on the canal by means of the chain system, with *remorqueurs*, 20 to 30 being thus easily towed. The locks are very large, and many vessels pass at the same time, and the trains are made up accordingly. When two meet, the ascending tug drops the chain, the train keeps on its right side, and the chain is again picked up by a grapple when the descending train has passed. With this system the vessels steer with the utmost ease, all having men at the helm. When approaching a lock the chain is thrown off in proper time, and the vessels' way being checked, they gradually settle side by side in the lock. Great skill and care is used by the men, damage by collision rarely occurring. A great advantage attends this system of towage, as the tugs make no wash, which so much destroys the banks of canals. The tolls are light, and the rates for towage very small. Empty vessels pay only 20c. for a *laissez passer vide*; this ticket, as in France, can be taken from any *bureau de navigation* to any other place in the kingdom or in the Republic.

Inland navigation in Belgium is under the Minister of Public Works. The last rules were published in the *Moniteur Belge* of May 3rd, 1881, No. 123, a copy of which the man in charge of any vessel must provide himself with. The passage of certain bridges and of all locks must be made between certain hours, according to the time of year; in the mid-summer, 4 a.m. to 9 p.m., and in mid-winter, 7 a.m. to 5 p.m. These rules are very detailed, and among them are those for regulating the speed of steamers to so many metres a minute, according to the draught of the vessels, to prevent damage being done to the banks by the wash of the swell raised. The

railway bridges are not opened after 20 minutes before the passing of a train, when the round red signal is lowered to show that the bridge is closed. These bridges are nicely balanced, so that two men can with the greatest ease and dispatch open them by aid of cog-wheels working on rack-work.

The general rules are divided into four sections:—1. Those applicable to vessels, rafts, and trains of timber, giving the conditions under which these are permitted to use the navigations, with those relating to vessels *en route*, the "patrons," or those in charge, the passage of locks and bridges, the mooring of vessels and of the *chômages*, or stoppage of navigation for repairs of the canal (which is duly announced a month previously), the loading and unloading of goods, the transport of powder and explosives, the navigation dues and draught of the vessels. 2. The special rules applicable to vessels working a regular and constant service, steamers, tugs, and trains of vessels towed by a *remorqueur* by aid of the chain system. 3. The conservation of the navigable ways and their dependencies. 4. Penalties, the officials charged with the management, *procès verbaux*, &c. These rules are very similar to those in force in France, but in the latter country they are more rigidly enforced. Order is thus preserved, and it is rarely that any difficulties occur between those engaged in navigating the various rivers and canals.\*

In Holland the carriage of goods is chiefly by water; almost every town and village has water communication which enables the weekly markets in the various centres to be supplied with farm produce and goods by the market vessels, which have their regular stations, for which they pay dues to the town authorities. A small toll of 1d. or ½d. is also paid at the bridges, which all open, thus aiding the communal rates. At the sluices or locks tonnage rates are paid, but these dues are comparatively light.

The Dutch Government has greatly improved the inland navigation in the past twenty years, the rivalry of Amsterdam and Rotterdam having given occasion for a vast expenditure in improving the access to these important cities for the large steamers of the present day. The most important of the new ship canals in Holland is the North Sea Canal, for which a new harbour was formed at

\* Many detailed particulars of canal navigation are given in "Through France and Belgium, by River and Canal, in the Steam Yacht *Ytène*," by W. J. C. Moens. 1876.

Ijmuiden, the *duinen* being pierced to give access to the waters of the IJ, which were deepened and contracted, much valuable land being thus reclaimed. In the outer and inner harbour and in the main-canal there is water for vessels of 6.50 metres draught, but in the canal east of Amsterdam this depth is reduced to 3.50 metres, and in those leading to Spaarndam for Haarlem, Leiden, &c., it is only 3 metres. The "General regulations of police, and tariff of the canal and harbour dues for the North-sea Canal, its harbours and branch canals," with a plan, &c., according to a resolution of October 26th, 1876, signed by the King of the Netherlands, are published by Wed. J. Ellerman, Amsterdam, price 50 cents.

This canal, communicating with the Zuyder Zee (where there is from two to three fathoms) by the great sluices at Schellingwoude, unites with the old North Holland Canal by the sluices or locks at the Tolhuis, opposite Amsterdam; all these locks, as is the case in all ship canals in Holland, are in duplicate, one being for large vessels and the other for the smaller inland *tjalcks* or market boats. By an ordinance of August 6th, 1880, new police rules for the North Holland Canal, which enters the sea at Nieuwediep, were authorised. Vessels drawing 4.80 metres, and at times 5 metres, can use this navigation, which, however, has lost its importance since the new North Sea Canal has been opened. A certain number of timber ships still discharge their cargoes at Purmerend, which are floated to Edam and there sawn into deals and planks. Numerous passenger steamers ply from Amsterdam to the towns of North Holland by this route, where the locks at Tolhuis and Purmerend are worked with great smartness, the delay being only a few minutes. As on other canals, the speed of steamers is regulated according to their draught, varying from 125 metres a minute for those over 2.75 metres draught to 250 metres for those of not more than 2 metres.

The ship canals communicating with Rotterdam are numerous, being

1. The Voorne Canal running from Helvoetsluis through the Island of Voorne to the River Maas. The resolution of March 9th, 1880, resettled the police regulations for this route; the maximum dimensions of vessels using it being—length, 110; beam, 13.70; draught, 6 metres.

2. The Nieuwe-waterweg, or direct entrance from the North Sea to the Maas, which is without sluices, and is cut through the Hoek van

Holland, thus forming a new outlet to the Maas.

Besides these approaches, there is another route to Rotterdam, to which great attention has been paid of late years, but the railway-bridge across the river at Rotterdam causes a certain inconvenience to vessels using it. Vessels coming from the sea by the Holland-schdiep, enter the narrow passage of the Kil near the great Moerdyke railway-bridge, and passing Dordrecht, the Maas is reached above the Rotterdam railway-bridge. The Nieuwe-Haven, just above this bridge, is a most convenient port for small steam-yachts visiting Rotterdam.

There are two other important ship canals, giving access from the River Schelde to the inland waters of Holland:—

1. The Walcheren Canal, about seven miles long, from the new port of Flushing to Veere, which place, formerly known as Campvere, was a free port of the Scotch, who had a factory, or trade station, there for 300 years, from the year 1506. The maximum dimensions for vessels using this canal are:—Length, 120; breadth, 19.75; and draught, 7.10 metres.

2. The South Beveland Canal, from the West Schelde at Hansweert to the East Schelde at Wemeldinge, is five miles in length. The regulations of this canal, fixed by the resolution of May 28th, 1880, allow vessels of the following dimensions to use it, viz., length 100, breadth 15.75, draught 6.20 metres.

The former of these two canals is but little used, but there is a great traffic of the large Rhine arks, and the inland steam barges and sailing vessels of Holland, going to and from Antwerp, Brussels, Ghent, and other towns of Belgium. The locks, like the others in the more important canals, take in 30 to 40 of these vessels at once, all masters having to show their papers before passing. These ship canals are all State property, and are under the management of the Minister of the Waterstaat, Trade and Industry. Many of the smaller inland navigations are under State control, but others belong to the communes through which they pass. The water level, which is so all-important in the Netherlands, is regulated by the Amsterdam mark, called the A.P. (*Amsterdamsche Peil*).

The following navigations, with some others, are also regulated by police rules, fixed by resolutions of the State:—

1. The Afwaterings Kanaal, from the Noordervaart and the Neeritter, near Venlo, for

vessels—length, 24; breadth, 3.70; draught, 1 metre. The use of steam is forbidden.

2. The canalised River IJssel, from the River Lek, opposite to IJsselmonde, to Gouda, whence there is canal communication with the River Amstel, to Amsterdam, and also by the old Rhine, *viâ* Leiden and Haarlem, to Spaandam, to the North Sea Canal. There is a great traffic in the former of these two routes, there being always a great collection of craft at the sluices at Gouda, waiting their turns to pass. Large and improved locks are urgently required at this place. The depth of water on this route is at least six feet.

3. The Keulsche Vaart, from Vreeswijk, on the River Lek, *viâ* Utrecht, the Vecht and Weesp, to the River Amstel, and Amsterdam. Vessels of a breadth of 7.50 metres, and draught of 2.10 metres, can use the route; the sluices take in the very long Rhine craft. The pace allowed for steamers is 130 metres a minute for those of 1.50 draught, to 180 a minute for those of 1 metre draught.

4. The Meppelerdiep, Zwaartsluis to Meppel, for vessels of length 60, breadth 7.80, draught 1.80 metres.

5. The Drentsche, Hoofdvaart and Kolonievvaart, from Meppel to Assen, for vessels drawing 1.60 metres, between Paradijssluis and Veenebrug, in other parts only 1.25 metres.

6. The Willemsvaart, from the town canal at Zwolle to the River IJssel, by the Katerveer, for vessels of length 100, breadth 11.80, and draught 3 metres.

7. The Apeldoorn Canal, from the IJssel at the sluis near Dieren to the same river at Hattem, for vessels of length 30, breadth 5.90, and draught 1.56 metres.

8. The Noordervaart, between the Zuid Willemsvaart at sluis No. 15 and the provincial canal at Beringen, in the commune Helden, for vessels of length 51, breadth 6, draught 1.50 to 1.65 metres.

9. The Dokkum Canal, from Dokkum (in Friesland) to Stroobos, and the Casper Roblesdiep or Kolonelsdiep, being the inland route from Friesland to Groningen. Vessels must not exceed 5.50 metres breadth and 1.60 metres draught on this route, but by the Dokkumerdiep, on the sea-coast, and entering again at the new sluice at Zoltkamp, vessels drawing eight feet can go to Groningen from Harlingen *viâ* Franeker and Leenwarden. The dairy farms of Friesland are much benefited by the network of canals intersecting this province, by which their butter is conveyed by

small boats to the markets held in all the small towns, thence it is conveyed twice a week in steam barges to Harlingen, from which port it is shipped at once to the London and other markets. Friesland can also be entered at Lemmer, on the south side of the province, whence Leeuwarden can be reached *viâ* Sneek, but there is not more than five feet water in some places. These routes are being improved by the State. From Groningen there is a deep water canal to Delfzijl, in the estuary of the River Emms, by which the inland navigation of Germany may be entered. The Baltic is thence reached by means of various rivers and canals.

There is another excellent canal from the Lek at Vianen, opposite Vreeswijk, to Gorcum on the Waal.

Space fails to detail the many other canals and navigable rivers of France, Belgium, and Holland, to say nothing of the vast River Rhine, the navigation of which is much improved of late years. The inland vessels using this latter river have increased enormously in size, and are to be measured by yards instead of feet, as our small barges are in England. Coal from the Ruhrort mines is brought by them so cheaply to Holland and Belgium, that at Amsterdam it sells from 1s. to 1s. 6d. per ton cheaper than English coal; this may account in some way for the present want of elasticity in our export of this article. At all the ports of the above three countries, which are connected by inland navigation with towns, there are pilot stations, with an ample supply of qualified men, for whose services charges are made according to the draught of vessels requiring their services. On inland rivers the supply depends on the demand; these men are very able, well knowing their business. On the Rhine the pilots only take charge of vessels in their own districts.\*

The great feature of the almost perfect system of inland navigation abroad, and which at once strikes Englishmen, is the vast scale on which it is constructed, and the ever increasing size of the barges and lighters. On the Rhine and in Holland vessels of 400 tons are commonly seen, and some of the lighters at Rotterdam are of 1,000 tons. All these, as the smaller barges of France and Belgium, have shifting hatches for the whole

\* A somewhat detailed account of "Through Holland by River and Canal in the Steam Yacht *Ytene*, R.V.Y.C.," was published in the *Field* newspaper of February and March, 1879.

length of the vessel, with the exception of those parts occupied by the forecastle and stern. The accommodation for the captain and men are excellent, and the gear and paint-work is maintained in a perfect manner. These vessels are as far superior to ours as their canals are to our canals. No useful details of canal organisation can be prepared without a careful study of the arrangements abroad. Holland has, for its size, by far the greatest inland water carrying power, Belgium follows; the physical conditions of France approach more nearly those of England, and it is probable that a similar system, on the French lines, would be found the most practicable for adoption. Water vegetation is found a great hindrance to the use of steam, unless the chain system with *remorqueurs* is adopted. It is found that constant traffic much prevents the growth of weeds, and it is on disused routes that these are chiefly found. In Holland steam barges of about 200 to 300 tons are fast supplanting the sailing craft.

Mr. U. A. Forbes, quoting the report of the House of Lords' Committee on Conservancy Boards, 1877, states that we have 210 rivers in England and Wales, 44 of which have been made more or less navigable, and that of 4,332 miles, constructed at a cost of £14,000,000, the railway companies have acquired 1,700 miles, thus throttling the system. He further tells us that a large portion of the large expenditure on canals, which is now valueless, might even yet be recovered by a more enlightened management.

It is evident that a reconstruction of the Thames and Severn Canal on the lines of the foreign canals, with locks of a sufficient size to take several barges, of say 250 tons, to be towed by the *remorqueur* system, would be found as advantageous to the coal owners of South Wales as to the consumers in London. A comparison with the freights abroad show that this coal could be carried at about 3s. to 4s. a ton. Many towns could be connected by waterways to sea ports, thus lightening the carriage of goods.

Money and land were never cheaper, the labouring classes are crying out for employment; could, therefore, confidence be once more felt in the possibility of a profitable working of inland navigation, a great step would be gained by reviving a system of carrying goods once much thought of in England, and still profitably used in many foreign countries.

## IMPROVEMENTS IN CANAL COMMUNICATION.

BY SAMUEL LLOYD.

When I was asked to prepare a paper upon canal communication for the British Association in Birmingham, in September, 1886, I prefaced it with a short history of canal navigation; but the present and future aspects of the question were considered so much more important, that I was requested to leave the past and confine my remarks to the pressing and immediate needs of the country. By those well qualified to judge they were then considered pressing and urgent, and how much more so now, after two more years of neglect and of foreign competition.

So dense and difficult to move is the public mind, that it generally takes 20 years to convince it, however good the proposed measure may be; but now events move quickly, and a conference like the present is of great value, as it elucidates information and expedites necessary changes that would be long delayed if left to isolated individual exertion.

The advantages of improved water communication, and its necessity for the welfare of the country, are so manifest to all who look into the question, that it is to be regretted that so many should excuse themselves from doing so. Members of Parliament hold back because they lack information, and the subject has not been brought before them by their constituents. Constituents hold back because if anything could be done they conclude their members would have attended to it. Some say it is too late, it ought to have been done before, other politicians aver it is too soon, it is a coming question, but the country is hardly ripe for it. They prefer not to be pioneers, but to wait till preliminary work has been accomplished by others; they have no time to attend to it.

As a proof that public authorities recognise the importance of the question, the Birmingham Chamber of Commerce, in 1885, declared "the exorbitant cost of carriage of goods" to the seaboard to be one of the special circumstances affecting the depression of trade in the Midland districts.

On the 5th April, 1887, the Birmingham Town Council passed this resolution:—"That this Council deems it to be of the utmost importance to the trade and commerce of Birmingham and the surrounding district that improved canal communication should be opened up, which should connect this great