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the fear that the racial and religious conflict in the Balkan region, which always threatens war, would involve all Europe in strife. At this writing it remains to be seen whether the victorious Balkan allies are sufficiently strong and united to hold the natural fruits of their victories against the wishes of the greater powers.

GLASGOW AND ITS HARBOR

By CHARLES A. McMURRY,

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SUGGESTIONS AS TO THE METHOD OF TREATING THIS TOPIC IN CLASSES.

1. Glasgow is an example of unusual energy and foresight in river and harbor improvement. It has resulted in building up one of the great world centers for ship-building, manufacturing and commerce.

The causes which have produced this result in a region of such limited area are remarkable and are well worth our study.

2. The physical advantages and hindrances peculiar to each city and its larger relations to world-commerce should be examined and thoughtfully estimated.

3. Maps of the harbors can be found in the guide books (as in Baedeker), in the larger cyclopedias (as the Britannica), in reports like that of the Chicago Harbor Commission, and in steamship advertisements. These should be reproduced, in simple outline form, on the blackboard, by both teacher and pupils, as class discussion may require.

4. Pictures, illustrating docks, warehouses, ships, loading and unloading, cranes, bridges, locks, dry docks, dredges, harbor jetties, ocean steamships and harbor scenes can be collected from magazines, advertisements of ship companies, geographies and books of travel.

The city of Glasgow was, a hundred fifty years ago, an inland town some 18 miles from deep water in the Forth of Clyde. In spite of the fact that it was so far from the ocean, its people were energetic enough to carry on a large trade in tobacco with the American colonies, and later in cotton and other goods. In those days goods, brought by ship for Glasgow, were unloaded some eighteen or twenty miles from the city. They were either hauled in wagons or placed in small barges and poled up the Clyde River with the inflowing tide. But the water in the Clyde was so shallow that even with the inflowing tide, it was only three feet deep at Glasgow, and, with low tide, only about one or two feet in places. At Dumbuck Ford, twelve miles below Glasgow, one could wade the river easily at low tide. Such was the condition of the river till 1770. But at this time the growing

trade of Glasgow with America and with other countries led the merchants and the city council to form plans for deepening the channel of the river so that larger vessels could come up to the city docks to unload.

After various surveys and plans, the English Parliament authorized the City Council of Glasgow to enter upon a plan of river improvement. An engineer, Mr. Golborne, who had offered a simple scheme of deepening the river, was allowed to undertake the work. He proposed to narrow the channel of the river by building a jetty half way across the river at Dumbuck Ford, thus forcing the water to confine itself to a narrow passage. After building the jetty he began to dredge out this narrow channel, removing the heavy gravel so that the water could scour out a deeper passage. He was successful in this even beyond expectation. He had agreed to make a channel six feet deep and three hundred feet wide, and when the magistrates examined the passage they found it nearly seven feet deep, and a few years later in 1781, it was found that the river had scoured out a passage at this place fifteen feet deep at low water.

Following up this plan, jetties were built along the river, narrowing the channel; dredging machines were set to work digging out the gravel in shallow places, and raking up the dredged material along the banks between the jetties. In this way the current of the river was steadily deepened and narrowed, and the banks on either side were built up higher. By 1809 plans were formed to deepen the river to such an extent that there would be nine feet of water all the way to the docks at Glasgow, with an average neap tide.

The work of river improvement went on till 1825, when the dredging machines were set to digging to produce a channel thirteen feet deep from Glasgow to the sea. This was a sufficient depth for ocean-going vessels of that time. From that period on, Glasgow has been an ocean port for large vessels, and her commerce has grown and extended to all parts of the world. As larger vessels were built it was necessary still further to deepen the whole course of the Clyde to the docks. As this ocean commerce grew, it became necessary to widen the river again so as to allow the passage in and out of a greater number of vessels. (The first steamboat in Europe was built at Port Glasgow and was put on the river in 1812. Others were soon after built and from this period ship-building and ocean commerce have had a remarkable growth along the Clyde.)

By the year 1836, the channel of the Clyde to Glasgow had been deepened to fifteen feet at high tide. The work of improving and dredging went steadily forward to meet the need of larger and more numerous vessels entering the harbor, till in 1895 the channel was 28 feet deep. Even the lower part of the river below Port Glasgow had to be deepened, sandbanks removed and the material carried out to sea. From the year 1845 on, an account of the amount of material dredged out and carried

away has been kept. During fifty years up to 1895, 46,000,000 cubic yards of dredge material were removed from the river bed at a total cost of £1,725,000, or about \$8,625,000.

One of the heaviest items of labor and expense in river improvement was the providing of docks and harbor room for the vessels wishing to load and unload goods at Glasgow. The river itself was narrow along the city, only about 145 feet wide, and there were, at first, no slips into which vessels could pass, but merely a landing place or quay built along the north bank. In 1800 this straight dock extended about a thousand feet along the bank. By 1831 this dock frontage had been extended about a mile along the river. But the river was now too narrow, and an expensive plan was carried out of widening it from 145 to 400 feet as it flowed through the city. The south bank had to be torn away and scooped out to the proper depth and a new shore line, with a long dock frontage was built on the south side of the river. By 1861, the extent of dockage along the river on both sides was about $2\frac{1}{2}$ miles. But this deepening and widening of the river and building of shore docks were merely the beginning of a much larger harbor improvement. What was needed was a system of wet docks with entrances from the river and extending back into the land, where vessels could pass in and quietly load or unload, undisturbed by the busy life in the main channel of the river. Accordingly the first wet dock was built on the south side of the river in 1867. Five and a half acres, back from the river shore, were excavated to the proper depth, provided with docks along the sides and an entrance made from the river. It was known as the Kingston dock.

In 1872 work was begun on the Queen's Dock on the north shore. When completed in 1881 it had a water area of $33\frac{3}{4}$ acres. The containing wall was built around it, and the solid earth was scooped out to a water depth of twenty feet at low tide and removed. It is divided by a central quay 195 feet broad into three water basins and supplies, within its area, a dock frontage of more than two miles.

The Queen's Dock was hardly completed before additional harbor room was needed and the great Cessnock Dock on the opposite or south side of the river from Queen's Dock was begun. It is somewhat larger than the other, containing 34 2-3 acres of water area and more than two miles of quayage. With the completion of these extensive wet docks the whole harbor was supplied with about eight miles of wharf frontage.

Since 1875 a series of immense drydocks, for the repairing of vessels and cleaning the holds, has been constructed. The large ship-building firms have also constructed wet and dry docks along the river banks below Glasgow as a part of their ship building outfit.

In the building of these various wet and dry docks the city govern-

ment of Glasgow spent up to 1890 about ten million dollars. The purchase of land for the extension of the harbor and widening of the river cost the city about \$7,500,000 more.

For the construction of other works in the harbor such as light-houses, buoys and beacons, and for cranes and hoisting apparatus for lifting and loading goods, and for other river improvements, \$8,500,000 have been spent. Between the years 1770 and 1896 there was spent in the improvement of the river and harbor from Point Glasgow to Glasgow bridge, £15,810,000, or \$79,000,000. It has been estimated by Mr. Albert Shaw that the total expense upon the river and harbor up to the year 1900 was about one hundred million dollars.

To meet this expense the city government has always levied a regular tax upon incoming vessels, and upon all merchants who enjoy the privileges of the harbor and docks.

The revenue of the Clyde Trust (That department of the city government which has had charge of the river and harbor improvement), as reported in the following table, is a good summary of the rapid and steady growth of the commerce of Glasgow. (Taken from Ball and Paten's "*Glasgow; Its Municipal Organization and Administration.*")

The income for each period of ten years is as follows:

1771-80	\$ 68,925
1781-90	96,925
1791-1800	155,565
1801-10	236,205
1811-20	300,095
1821-30	650,195
1831-40	1,640,890
1841-50	2,574,585
1851-60	4,043,865
1861-70	6,470,315
1871-80	9,846,600
1881-90	14,747,430

From 1890-95 the income was \$8,080,475.

While the expense for these improvements has been great and increasing, the income from river and harbor tolls has increased more rapidly, the financial management has been entirely successful, and the river and harbor improvements have been of untold advantage to the city. The city also owns and manages a fleet of ferries and river steamers, for the transport of passengers and goods and thus secures a profit from this source.

The improvement of the Clyde navigation, which has been of such vast importance in building up the business and commerce of Glasgow, has been wholly managed by the City Council under laws passed by Parliament

in London. Private companies have had nothing to do with the control or management of these works.

The advantages which have come to Glasgow from deepening the river and digging out extensive harbors, with miles of well built wharves, have also built up a series of large towns and even cities along the river all the way to the sea. Patrick has 65,000 population, Govan 90,000, Renfrew 11,000; Clydebank 40,000, and there are several others of large size.

The population of the Glasgow district is now about one million. A hundred years ago its population was about 80,000. This remarkable growth is the more surprising because the land actually tributary to Glasgow reaches back only about twenty-five miles, a very small basis for a great city, in fact an area about as large as one of the Illinois counties.

The people of Glasgow have shown a very unusual energy in developing their small river and harbor. The expense was enormous, but they have made this little stream one of the most important navigable rivers in the world, and this little valley in the lowlands of Scotland has grown into an industrial centre as important as Pittsburg, with its twenty neighboring towns and suburbs.

EAST AND WEST, AND NORTH AND SOUTH TRAFFIC

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FOR hundreds of years the chief commercial movements of the world's commodities have been east and west. Manufactures made in regions relatively thickly settled and less devoted to agriculture, have been sent to thinly populated territory, to people not engaged in manufacturing. And in return grain, stock, iron, and lumber have been sent from agricultural and mining districts to centers of manufacturing. Now that the population is becoming more uniformly distributed and manufacturing more general, while new lands for producing raw materials have vanished, there is less necessity for east and west trade.

The east and west intercourse was an adjustment to a temporary condition and not a response to a permanent difference between the resources or needs of the east and west. The future east and west traffic will correspond to geographic differences in the location of raw materials and manufacturing power, not to the economic division between the closely settled country and the free farm and grazing land. It becomes evident therefore, that east-west transportation will become *relatively* less important.

There is, however, a profound difference between the north and south, a difference more or less permanent which must soon call forth a much greater development of north and south trade. Tropical regions with their