The River of Gold

Great empires were not founded by men who spent most of the day farming, or fishing, or hunting. The theory that taxation is the basis for human development, and that rivers are the principle location for successful, long-term civilisation, is borne out by history. Human history provides a chronological list of the great empires. The role of rivers in other empires is less obvious, and needs to be explained. Athens is not based on a river at all, Rome has only a desultory stream most of the year, and the greatest empire of Africa was based in the middle of the Sahara. Other rivers have failed to stimulate any kind of empire at all, and that too requires an explanation to fit the theory: the Amazon is the greatest river of all, and although the Brazilian Empire did exist, and it was large, it never extended its power outside its own borders.

This chapter also explains the Trojan War of Greek mythology, and the Ring of the Nibelung and the Rhine Gold of German mythology, and shows how these were not myths but stories of taxation. This chapter starts and ends at the sites of some of the earliest stories to be documented in human history, the flood myths. Floods can only desperately affect those who congregate and invest in low-lying areas, areas which would be avoided by livestock herders, transporters, and not affect at all nomadic or even semi-nomadic hunters and gatherers.

The Floods of Gilgamesh and Noah, which happened in Mesopotamia, and of the Yellow River in China, needed a stable population to afflict, as well as some form of oral or written record-keeping. In the myths, it is human ingenuity, with divine guidance, perhaps, that allows at least some of the population to survive. Whereas in China it was hydraulic engineering that saved the day, in Mesopotamia it was Noah's carpentry skills, and Gilgamesh preferred the construction of giant cities; in all cases, it was the organisation of humans, that prevailed. The ability to manage large groups of humans immediately gave those groups a military advantage over their unmanaged neighbours. The result was that in China, the flood led to the first Chinese empire; while in Mesopotamia, the Flood led to the first Sumerian empire.

The North West Passage

The First Arrivers

The US has the fourth largest network of navigable waterways, after China, Russia and Brazil, and together with Canada and its almost unlimited and unused lakes and rivers, possesses probably the largest amount of water that is naturally navigable. Even though the official Russian waterways are longer, the US transports ten times more weight of goods along theirs. [1] It is not surprising that the US should be the centre of the most powerful economic empire of all time, extending its control and influence over the entire maritime environment, and with favourable trading agreements with 80% of the countries of the world. [2] What is surprising is that the United States, and north America in general, was not the centre of a great empire any earlier than 1850, and for ten thousand years from the first human occupation, there were no empires anywhere in America at all.

Partly, the failure to develop empires in America was caused by the rivers themselves. Only some of today's rivers are navigable year round; some are frozen in winter, or dry in the summer, or flooding in Spring. There are few navigable rivers, indeed there are few rivers at all, on America's western coast, north and south. There are also few good ports, few sizeable islands to provide protection from the prevailing westerly winds and currents. The currents are exacerbated by the steep fall from the tops of some of the highest mountains in the world to the nearby depths of some of the deepest ocean chasms, making the west coast of America a surfer's paradise but a sailor's nightmare. The largest rivers in America which are entirely in, or debouch, in tropical or sub-tropical regions, or arctic regions, encourage subsistence not improvement. Finally, to round America, it was necessary to travel distances immeasurable to early Man, a journey which could be achieved only through the narrow passage of the Magellan Strait, a dangerous and unpredictable route, or around Cape Horn, a predictable and difficult one. The northern passage across Canada was first crossed in a single season as late as 1944, and now supports annual trade, but only for a few weeks in the late summer.

There were, however, substantial empires before European colonisation in other parts of America. The Mayan empire first evolved by about 3000BC, based around great natural lakes, on the narrow stretch between the Atlantic and the Pacific. [3] The greatest empire in terms of geographic spread and duration of the pre-Columbian American civilisations, the Maya started with obsidian as a trade good. Obsidian is widely available in two areas of central America, which became the centres of Mayan civilisation: in the area that is today Guatemala; and southern Mexico around Mexico City. Obsidian knives were regularly used in cult rites of

[1] China outperforms all other countries, shipping twice the weight of goods than the US, 1.2 B tons pa, on the longest navigable waterways in the world. The river Yangtze is the most heavily used river for shipping freight in the world. Even so, from 1900 until the 1930s, most of the freight on the Yangtze was shipped in American bottoms. [107]

[2] The favourable trading agreements that were set up under GATT, the General Agreement on Trade and Tariffs, and later under the WTO, the World Trade Organisation, were designed to favour net exporting countries, of which the United States was the largest, and the initial signatories, the European nations like Great Britain were all colonial countries with the expectation that they would be net exporters. Today, the United States is not a net exporter, but the world's largest net importer, so WTO is a disaster for the American economy; but American politics are controlled by a small number of exporting companies, for whom the reduction of tariffs is beneficial. It is clear from the United States' economic indicators that it is no longer the most powerful economic power, merely the largest when measured by GDP. As argued elsewhere, GDP is a measure of weight, not power, which is measured by net exports.

[3] Panama is not a good site for taxation, as it is easy to circumvent any tax barriers by canoe, and difficult to walk along its length. The natural geography, the kink in America, along with many islands off the coast, make the sea journey much shorter than the land one, and relatively safe for small craft. Even today, the Darien Gap, between Panama and Colombia, is an almost impassable jungle.

genital mutilation and general piercing. These practices were often confused by Europeans for circumcision, although it appears that the practice was not specifically to remove the prepuce but to draw blood.

The narrow neck of central America was ideal to trap traders crossing from one ocean to the other, or travelling along its length. Much of the trade was along the coast, but it was too difficult to catch them there, so the great Mayan cities are inland, along rivers or on lakes. As the lakes diminished in size due to silt, so too did the taxing opportunities. The centres of the Mayan empire moved to better locations, and never fully disappeared until long after the Spanish invasions.

At the time of the founding of the Roman empire, when Rome was the largest city in the world, Teotihuacán in Mexico was larger than any other city in Europe. Neither the Mayan nor the Teotihuacan were isolated or short-lived empires. Teotihuacan was the centre of a civilisation that lasted more than a thousand years, and was quickly followed by the Toltec, which lasted for a few hundred years before it was replaced by the Aztec. The Olmec civilisation survived contemporaneously with the early Mayan civilisation. To trade in obsidian was added trade in salt, necessary to support the large population of central America. In this area there were no llamas to carry loads, so the rivers and lakes were essential for transport, and the great cities of central America would have been impossible away from water.[4] Even so, there was a limit to how large and rich such a city could become.

By about 1500AD, the Inca empire that operated with the support of llamas was the greatest of the pre-Colombian empires. It probably numbered ten or twelve million people. This was tiny compared to contemporary empires in India and China, but bigger not only than weak countries like England, but also the more powerful of the Western empires, the Venetian and the Portuguese. Only Spain and France had similar populations controlled by a single tax-collector.

There were many similarities between European civilisations and American ones. Both had administrative organisations with rules and hierarchy, and a supreme tax-collector. American civilisations had written language and a calendar, and a religion very similar to Christianity. They played games like football against other villages and gambled on the result. There were villages and towns and cities, with some of the largest cities on the planet. Many of the towns numbered thousands of people. Both groups met challenges to their tax-collecting system with violence, and were organised and equipped to carry out war. There were roads and causeways across lakes, boats and canals. The Aztecs built aqueducts to bring fresh water to their cities and farms, dikes to protect them from floods; all the great American civilisations were excellent builders, raising pyramids, temples, and showing some of the greatest stonework anywhere in the world in the great Inca and pre-Inca constructions.

There was one great difference between the European and the American civilisations in the year 1500: the military technology that they possessed. The Europeans had massive superiority in capacity for violence. By the time of Columbus' Second Voyage, they were mounted on horseback. They were armoured, and were armed with swords of Toledo steel, then the most dangerous weapon on the planet. They also had firearms. The Americans that they encountered had stone axes and wooden bows and arrows. Even the great empires of the Incas and Aztecs were at a technological level equivalent to those of the Assyrians 3000 years earlier. They had the ability to build ziggurats and temples, but neither arches nor domes. Metallurgy was basic, almost limited to gold and silver. Warfare consisted of rolling stones and tree-trunks down on attackers; the few military weapons were made with obsidian, a good tool in the kitchen but less suitable for warfare, and almost useless against armoured troops.

[4] The turkey was domesticated in this area, and dogs were common and may have helped, and while dogs were common beasts of burden in arctic conditions, where they could pull sledges, the loads they could carry in central America would have been much less than could be carried by a slave human.

Outside the major empires, Americans were still living in the Stone Age. In such conditions, only a handful of Spaniards could survive against native forces, and it would take only a few hundred to bring down the greatest empires of America.

The Europeans conquered those areas near the Atlantic coast, and then started moving inland, limited only by their available man-power, and the cost and time necessary to move equipment and men across the Atlantic. [5]

The Land of the Free

European colonisation of America was an accident. An empty continent that had little cash was of no interest to those able to finance the great trading voyages of Columbus, Cabot or da Gama. They wanted to reach China, the largest market in the world, or at least the Spice Islands, whose produce could be shipped back to Europe cheaply and quickly by sea, avoiding the taxes imposed by Indians, Turks and Venetians.

The first arrivals of this new wave of American immigration, the Spaniards, quickly changed their minds. They found that the massive military and technical superiority ensured by gun-powder weapons, the mass production of ball and powder, and almost any kind of military clothing, made them virtually impregnable and invincible on the battle field. They turned instead to the taxation of the locals as a means of repaying their investors' debt. They demanded a monthly payment of gold. They quickly found that the more they demanded, the more they received. The quantities collected at first rose, then fell when local resources were exhausted and competition between the different Spaniards merely forced the Indians to encroach on each other's territories.

European diseases, brutality, and the inevitable wars unleashed when the natives refused to pay their taxes, reduced the Caribbean and, later, the American population by as much as 90%, leaving them unable to defend their lands against concerted effort by professional soldiers, or even, as the military technology developed, from farmers and hunters armed with muskets, and rifles. The rapidly improving military technology merely increased the physical superiority of the Europeans, and their willingness to oppress the natives. When natives disappeared, they were replaced by slaves, brought in from Africa in ever-increasing numbers.

The rapid decline in native population also left large tracts of land empty, into which the Europeans could move with impunity, but also without a sense of guilt, and without having to kill natives. Most of America was occupied on European arrival, and although the natives were extensive farmers at best, and generally hunter-gatherers, or slash-and-burn farmers, all land was administered, owned and exploited in some way, as is the case with traditional societies today in the Arctic, Papua New Guinea, or the Amazon. The temporary population decline, and the lack of written documentation, made European usurpation easy, from the European point of view. The surviving natives reacted in a reasonable way, attacking settlers, kidnapping women and children to try to replenish their tribes, moving away, or forming alliances against one or other European group. Inevitably, their poor fertility and technology told against them, and attacks on Europeans merely brought massive retaliation, which reduced their numbers still further. The ethnic cleansing was completed by forced marches to distant areas. Within a hundred years of its first official discovery by Europeans, most of the Caribbean coast and many of the islands were occupied, along with much of what is now Mexico, Panama, and the few good ports along the coast to Ecuador and Peru. Within another hundred years, all

[5] This was a formidable challenge in 1492, and was still a major event in 1620 when the first Pilgrims established their colony in Massachusetts. It would remain a dangerous crossing into the 20th Century, with the sinking of the Titanic, the Lusitania and many thousands of ships during the two World Wars highlighting the problem of transoceanic transport.

of the north American Atlantic coast was occupied, the interior of Canada along the St Lawrence River and the Hudson Bay, Brazil and Argentina.

The first to arrive in America were Spaniards, but they were quickly followed by the Portuguese, Dutch, French and English. Many colonists were pilgrims, escaping what they saw as religious persecution, but which was really nothing more than targeted taxation. In America, they set themselves up in Liberty, the freedom from oppressive taxation, especially any that claimed a religious authority. They were mainly farmers, or followed a trade that supported agriculture, like smithing. None of them came without a debt that had to be repaid from a profitable exploitation of the territory or the natives. Some incurred a debt to their liege or king in exchange for a grant of exploitation or monopoly of trade, others borrowed the money from limited stock companies. Still others had no such grandiose means and paid their way across as indentured servants, promising to work for 8 or 10 or 20 years to pay off the cost of transport. Few survived. If the crossing did not kill them, the diseases they contracted on board, the poor food and worse water, and the weather, insects and natives that awaited them in America, ensured that initial first year survival rates were about 10%, and only rose slowly. The use by the natives of poison in traps and on their spear and arrow tips ensured that it was the religiously-uptight, well-dressed to cover every inch of their skin in leather or cloth, that survived best; America's heritage of paranoid religious puritanism was reinforced through generations of natural selection.

The small number that survived was enough. Well-armed and forced to repay their debts, the European settlers, colonists and their African slaves found many traditional and some new ways of making a profit. In the idealist North, these were mainly agricultural, from trapping, hunting, fishing, farming and woodwork. There was little incentive to improve the transport infrastructure, as the East coast was well-equipped with rivers fit for their purpose, and industry was restricted more by the available manpower than by any limitations in water-borne transport.

Americans were little interested in the water; sailors and ship's carpenters could earn more money sailing back to Europe than settling in the colonies. Apart from the canoes necessary for hunting, there was no ship or boat building until the Spaniards crossed to the Pacific, and there built small boxy ships to explore the coast of Peru.

As a colony of trading companies, there was little requirement for local taxation other than the usual shared responsibilities like house-building, managed by corvée. Unlike the Spaniards, the English, British and French colonists did not try to tax the native inhabitants, although they did enslave them if they were captured in wars. Perhaps this was mainly a French practice, the north American natives made poor slaves, and the practice did not survive the demise of the French in northern America in 1759. Taxation in Anglo-French America therefore followed the customs of the area, an area generally populated by First Leavers who paid no oppressive taxes. Even after independence, once the new-born USA had paid off its war debt, there was no real federal taxation, no oppressive taxation; citizens could live their lives without interference from some far off entity claiming 10% for nothing.

The USA was run on excise duty, which provided 90% of its government income, for the first 100 years. This simple tax, which was easy to collect in the main harbours of cities like Boston and New York, was enough to pay the bills for a government that had not yet set out to conquer. Nor did the US need to defend itself from external enemies as these were too far away to worry it. Finally, the US was populated by iconoclasts. So, war, castles and luxuries were not needed, and taxes remained low. When Americans talk about the *Land of the Free*, this is what they are referring to: that they do not pay taxes. [6] The average American

[6] Today's Americans do pay considerable amounts in taxes but still low compared to their cousins in Europe.

in his daily work paid no taxes when buying or selling, and paid none for possession of land. He usually paid to purchase the land, which had been appropriated through acquisition from Indian tribes, the Spanish, French or Russians, or through war. But he was then the owner of the land, not as in England the owner of a lease with the Queen the ultimate title-holder. An American needed to ask no-one's permission to sell it, nor to develop it as he saw fit.

The European colonies and the later US operated a minimal government, and with a tiny army and no navy its expenses were considerably less than those of a comparable European power. The low taxes encouraged investment, and clear ownership rules regarding property and business encouraged improvement. But for a long time this investment was mainly focused on quality of life, and simple but magnificent estancias, plantations and estates grew up across European America. In contrast, there was little formal development of towns and cities.

When Americans decided to build towns and cities, the lack of any formal taxes inland led to urban developments that were vastly different from those encountered in Europe. There were no taxes on bridges, so for a long time there were few bridges, and therefore no hindrance to river traffic. American bridge-building started only at the end of the 17th Century, 18 are listed for the 18th Century, and the Revolutionary and Napoleonic Wars provided the economic impetus for a spate of building turnpikes, and the bridges that they required, as did the canal and railway booms of the 19th Century. Without federal or state taxes to pay for bridges, most were built as investments, either by a local ferry operator, or to compete with one. Return on the investment was achieved through a toll. The toll was limited to the amount needed to recover the investment, and was a flat rate, not a variable depending on the value of the cargo.

American bridges look immediately different to European ones. When bridges were built, there were no tax-collectors at bridges, so there were no castles looming above them in which to store huge quantities of market goods. There were no castles next to rivers and bridges, so the towns that developed could do so in the best place for urban development, on high ground surrounded by farmland, perhaps, or near mines or forests. There was no feudal power, and no religious power taking tithes, so there were no tithe barns, and no bishop's palaces, abbots palaces, vicar's mansions built with benefices. Tolls had to be paid in cash, not in goods, so a society was created in which all kinds of money were used for exchange.

If there were no tax-collectors in the northern Americas, there were plenty of indebted Americans. Many of them failed to pay their debts; they fled, and the American legal system developed to allow this to happen, with limited feudal obligations and generally lax identification. Others found ways to pay off the debt, and they supplied the passing pilgrims and merchants in the usual way of Europeans, by offering food, lodging, or that peculiar American invention in a land of no monasteries, snake oil. The best locations for selling snake oil demanded a quick getaway, but for the rest, the usual tax locations of narrow gorges, mountain passes, fords and bridges formed the nuclei of the first cities.

The first cities inland were mainly at the sites of portage between rivers, where canoes had to be loaded and unloaded, could be repaired, and the goods they carried sold, stored, processed or bought. The very nature of portage presents only a single best route between two lakes or rivers. The most important portages were those that enabled connection to the great river system of the Mississippi-Missouri, which with its many tributaries like the Ohio is one of the largest navigable waterways in the world. Cities that grew up on portages to this river system include Chicago, on the portage to Lake Michigan; Pittsburgh to Chesapeake Bay; and Cleveland to Lake Erie.

Portage still implied small, light, valuable goods, like beaver fur. American rivers were not yet fit for bulk transport like wheat, beef, livestock, building materials. Not only were the rivers unimproved, but in many cases they were frozen in winter, and raging rapids blocked large sections of the most important rivers connecting the Great Lakes. There was no tax money to build quays and docks, dig canals or to dredge the rapids. All this changed with the

War of 1812, in which the British, fighting against the French in Europe and anywhere else they could find them, blockaded America.

The Salt Canal

The largest US salt works was in Onondaga, near today's Syracuse, NY. The land for the Onondaga salt mines had been bought from the local Indians for 150 bushels of salt a year, in what was probably a fair deal. Much of the salt was shipped down the St Lawrence River to reach the sea. During the war between Britain and the US 1812-15, Britain blockaded the coast around Cape Cod, and prevented the US from salting its cod. The US now determined to build its greatest engineering challenge so far, a canal to transport salt from Onondaga to New York.

There were also other entrepreneurs who saw that the large plains of the mid-West, and even of northern New York, could be turned into profits. The product that is typical of the Canadian prairie and Great Plains today, wheat, was not economically viable due to the cost of transport, and ended up in sour mash bins to make whiskey. The only major exports were beaver pelts and ginseng, both light and valuable products that could be taken out by canoe and portage to the ships that ran the St Lawrence in summer and autumn. What was needed was a year-round navigable waterway that reached an American port on the Atlantic seaboard.

Canals had been built in America by private companies, and with private interests at stake, usually to increase the trade of a city, farm or business. Americans had watched the French and British develop canals as economic stimulants. Cities along the eastern seaboard were aware that whichever was the first to link themselves with a navigable waterway to the Ohio River or the Great Lakes would become rich. George Washington had sunk considerable money and time to build the Potomac canal to the Ohio River, but it only operated a few months of the year, and the tolls could not even pay the interest on the construction costs. So it is surprising that New York finally succumbed to canal mania and subscribed $7 Million to build a canal to the Great Lakes. It took 8 years to build the 363 miles, and the project, managed by lawyers and administrators and without a single engineer on-board, came in on budget.

The canal was only 4' deep. Even so, the Erie Canal cut transport costs for goods between the Atlantic and the Great lakes by 95%, and halved the time. This was a good example of the superiority of water-borne goods, and the direct route that avoided the detour of the St Lawrence, which was closed for five months of the year due to ice, or the mule hike across the Catskills.

The canal was an immediate success, in spite of its limited depth and its single towpath. The initial target had been 1.5 Million tons, and this was achieved in the first year. Tonnage eventually grew to more than 5 Million tons a year. When Britain repealed the Corn Laws, it became possible to export cheap wheat to Canada and Britain. The Canal was already there. Reduced costs also enabled heavy machinery to be shipped west, eventually making the mid-West America's industrial centre. Process industries set up along the Great Lakes' coasts, with plenty of free water and cheap land: palm oil was imported along the canal from Nigeria to the Palmolive factory in Milwaukee, which became the largest soap factory in the world.

As well as the tolls collected on the canal, the increased business in New York brought in customs revenue for the Federal government. New York alone now financed all of the government's expenditure. At the head of the navigable waterway, New York became the financial, trade and shipping capital of the New World. As such, it replaced Boston, Philadelphia, Baltimore and Richmond, the great cities of the early period of American colonisation. No longer was it just a port in a state, but it was a state in itself, the Empire State.

Without any serious competition for transport, the canal charged tolls to users, starting at 4/60% of the value of the load, 6.7%. This was quite a heavy tax but was increased

eventually to 12.5 % to pay off the cost. The full debt of construction was paid off in ten years. The tolls were not reduced, but were used to enlarge, deepen and increase the length of the canal

The canal accidentally debouched next to the Niagara Falls. These were converted into a tourist destination, and soon 40,000 passengers a year were travelling the canal to see them, inventing modern pilgrimages. Today, the Canal is free to use for tourists, but funded by motorway tolls. It is still the cheapest way to transport heavy goods, less than half the price per ton of rail and almost 10 times cheaper than truck.

If the Erie Canal also spurred the Ohio state to invest in their own canal, to link the Ohio River and Lake Erie. Ohio at this time had a population of no more than fifty thousand people. The first stretch opened in 1828, three years after the completion of the Erie Canal. The connection to the Ohio River opened up the development of the upper Ohio River for industry. Akron became the world capital of the rubber tyre industry; Columbus was the world buggy capital; Standard Oil was founded in Cleveland, which was an early pioneer of electric, steam and petrol-driven vehicles; Cincinnati became the centre for pork processing; Toledo became the glass capital. All were soon among the largest cities in America.

Upriver from Lake Erie, the canal also increased the colonisation of Lake Michigan, with great cities established at portage points, like Chicago. Chicago and all the land around was part of the Louisiana Purchase which America claimed. Various wars were needed to make the native population accept these claims. In particular, the portage between Lake Michigan and the Mississippi was included in the 1833 Treaty of Chicago, which led to its foundation. In 1836, a canal was started across the portage, to link Lake Michigan to the Mississippi valley; it was completed in 1845, and cost a little over $6 Million. Chicago has grown to become the third city of north America. Further north, Milwaukee was founded in 1835; that it was founded at the end of the so-called Bridge War shows the importance of bridges, even when taxes were not part of the equation.

With communications established between the Atlantic, Lake Erie and the Ohio River, and from there down the Mississippi to the Gulf of Mexico, American waterways were well established to support a growth in industry. There still remained some obstacles to cross. The great natural waterway of the St Lawrence River that divides the US from Canada was navigable up to the Niagara Falls, and the Erie Canal was extended to include a line to Lake Ontario, bypassing the great falls. From Lake Erie, the Great Lakes can be navigated up to the rapids at Sault-Ste-Marie: *sault* is the French word for jump, or rapid.

The rapids at Sault-Sainte-Marie, between the Lakes Superior and Huron prevented ships and therefore trade in heavy products from descending the Saint Lawrence. Lighter loads, beaver pelt, for example, could be brought by canoe and portaged around the rapids. In 1798, a lock was built to bypass the rapids. This was destroyed by the US during the 1812 War. The US built its own locks in 1855, capable of carrying ocean-going ships. In 1895, Canada built its own locks, the largest in the world at the time, but accidental damage and its repair makes it only usable by tourist traffic today. Ice still shuts the locks, as it shuts much of the traffic on the Great Lakes. Even so, ten thousand ships a year pass through these locks, making them the greatest concentration of canal traffic in the world.

The American Civil War was started and won by industrial powers on the Great Lakes, and they ensured that protectionism and the rise of cartels disadvantaged the mills and smelters on the East coast, which had been built to serve the European market. A new breed of industrialists grew up near the American sources of supply or raw materials, around the Great Lakes, near Milwaukee, Chicago, Cleveland. US Steel set up its great smelting plants at Gary, Indiana, just down-lake from Chicago on Lake Michigan, Standard Oil was based at Cleveland, on Lake Erie. Eventually, the St Lawrence River was dredged and canalised to allow ocean-going shipping to reach the Great Lakes, further reducing the cost of bulk transport.

The effect of water, and of navigable waterways in particular, on population density can best be seen by the example of modern USA. The United States shows the impact of navigable waterways on population and economic growth. The population density of mainland states with long sea-coasts dominate the top ten: New Jersey, Rhode Island, Massachusetts, Connecticut, Maryland, Delaware, New York, Florida, Ohio, California; while the bottom ten are all inland: Kansas, Utah, Nevada, Nebraska, Idaho, New Mexico, South and North Dakota, Montana, Wyoming. These inland states are also the ones furthest from inland waterways. Inland states with high densities like Illinois, Milwaukee, Ohio, Michigan, Indiana, Tennessee and Kentucky are either on a Mississippi-Missouri tributary, or on the Great Lakes which feed the St Lawrence. This is not unusual: all countries with the greatest navigable waterways have similar population distribution. [7]

The other effect of all this canal building was to make New Orleans a competing centre for America's import and export business. For the Louisiana merchants, what was important was a tax-free operation, to encourage as much traffic as possible. In the US in general, customs were the main contributor to the US Revenue. As New Orleans expanded its imports of machinery to the growing South, and exports of cotton and grain to Europe, the industrial heartland of the mid-West was developing. Their machinery was produced in small numbers, in plants ill-equipped for mass production, and with a high cost of labour due to a general shortage in America. The factory owners demanded protection from their politicians. When Abraham Lincoln was elected, he immediately increased the taxes on machinery imports, and blocked the ports of the south with soldiers to enforce them. The American Civil War had started.

Railways, Mule and Waggons

The United States had paid off the debt it had incurred for Independence, and the War against Britain of 1812, by 1830, and it operated almost debt free until the start of the Civil War. In five years of war, the US collected $2.76 Billion of debt, and was forced to introduce a raft of new taxes, including income tax, to pay for it. The debt was eventually reduced, and income tax was repealed after ten years.

The development of industry in north America was led by the American Civil War, and its need for industrial quantities of cotton cloth, gunpowder, brass cartridges and iron cannons. But it was not canals and navigable waterways that ensured the destruction of the Confederate South in the Civil War, but the building of miles of railways, and the breeding of millions of mules.

American cities reacted with alarm to new that New York was building the Erie Canal. A spate of canal building projects started, but it was the development by Baltimore of a monopoly railway to the Ohio River that would be successful, although it did not reach the river until 1850. By 1830, a railway was operating alongside the Erie Canal. As in England, railways were bought as monopolies from government, in this case the US Congress. With certain rights on the land they passed, and little regulation, they were highly profitable, and many fortunes were made, and lost. The Gould, Harriman and Vanderbilt fortunes were made

[7] Listing countries by length of navigable waterways is fraught with problems, and no conclusive list can exist. Definitions of *navigable* and *waterway* are highly personal, and while navigations and canals are usually defined in international terms, lakes are not. Countries like Russia and Canada are cold enough in winter for most of their waterways to be unnavigable for months of the year. Even the definition of a lake is not agreed, with bays, seas and wide rivers sometimes included, and at other times ignored. Even so, some countries are clearly more favoured by nature than others, and the larger countries of the world are generally more favoured than the smaller. Human efforts at improvement have had a significant effect in maintaining waterways navigable as ship size has increased and silt has descended the rivers or filled the lakes and bays.

in rail, as were those of Johns Hopkins, Leland Stanford. Vanderbilt was the richest man in the world. The length of railways in the USA overtook that of Britain during the Civil War. After the War, the southern railways were changed to the Northern gauge, and connected; large-scale corporate amalgamations took place, and rail was pushed across the continent, linking California to the Atlantic. The first railroad was so successful that there were soon 5 competing for trans-continental business, with an additional one in Canada.

Where railways could not operate, and while waiting for rail to reach outlying districts, the mule was pressed into service for long-hauling commodities. George Washington had asked the king of Spain for some of his special large donkeys, and American mules were soon as powerful as those in Spain. Mules were especially popular in the South, but victory in the Civil War by the North curiously made the southern mule acceptable, and soon the mule was in use across America. In the Death Valley of California, 20-mule teams could haul 36 ton loads, covering 15 or 20 miles a day on a ten day march. The wagons themselves were engineering feats, and could carry ten tons of borax each. Wagons have left their mark on America, with their wheels they scratched the rocks permanently across the continent as European settlers moved west.

It was the Homestead Acts that granted free land to settlers that had encouraged the mass migration to the West. Millions moved, and most used mules either to pull their wagons or to plough their farms. The US had always sold land, in parcels of a square mile, 640 acres, at a price of $1 per acre. There were few who could afford this, and Southerners took advantage to buy up large estates which used slave labour. Northern politicians took advantage to Secession to pass the Homestead Act in 1862, granting 160 acres free of charge, except for a small filing fee. Settlers, soldiers, and immigrants took advantage.

The drivers of these teams of mules were known as teamsters, and when they organised themselves as a trade union they became the most powerful organisation in American labor. As transport moved from mules to trucks, teamsters became truck drives. Their ability to make or break a strike made them an invaluable or valuable partner in any dispute, and their lucrative trade with organised crime an additional source of revenue. Topping a million members, the Teamsters were the largest union in the United States. Their pension fund financed the Mafia's building of Las Vegas, and their presidents were indicted and eventually imprisoned for a raft of crimes. One, Jimmy Hoffa, disappeared after his release from prison; his son, James, is president of the union today.

While rail freight traffic and Teamsters' driven road traffic continue to grow in the US, waterborne freight is in long-term decline, halving since its peak in 1979. Road accounts for almost half the total ton-miles of freight, with rail a little less than a third. Much of the rest of the weight is carried by pipelines, a peculiar American invention. The United States still carries much of the world's pipeline traffic, oil from Alaska, and gas from its fracking sites.

Great engineers from China, Rome and Arabia had long piped water for irrigation, display, industrial purposes and drinking and sewage. But it was only in the 19th Century that the pipe was turned for long-distance transport of other goods. It was the discovery of oil, and the Standard Oil's monopoly control of the railways that shipped it to New York, that led to the development of the first industrial pipeline by a small competitor. Initially, John D, Rockefeller tried to smash the pipeline, but eventually he saw the value of it and acquired it; he built many more. As with wheels and rails, a pipeline reduces the friction inherent in ground transport, but is only suitable for liquid or near liquid products. Oil and gas are the commercially important goods transferred by pipeline.

Like the turnpike, canal and railway, the pipeline required certain preconditions for investment: preferably a monopoly; acceptance by the tax-collector, along with the protection from violence that only a holder of its monopoly could guarantee; title, so that its service could be sold, and the asset itself sold off at a profit. In the US, the monopoly of violence was difficult

to achieve. The Federal government had few resources, the State government had a militia, but there were armed natives in many parts of America until 1890 when with the slaughter of the buffalo herds the last remnants were shoved into reservations; the colonial immigrants were all heavily armed; and the companies employed toughs to break strikes and attack competitors. Direct legal action did provide some protection, but as usual it provided more for the strong than the weak. Political action was usually slow, but as a result of Standard Oil's behaviour, and that of a number of other trusts, and the death of president McKinley at the hands of an anarchist brought vice-president Roosevelt to power with a strong desire to attack the monopolies. American protectionism did little to improve the economy, but it did lead to a general improvement in labor conditions, but violent strikes remained a feature of American industry. Inevitably, it took a combination of political, legal and physical power to build pipelines in America.

With a ring of navigable waterways in eastern USA, railways that crossed the continent, and pipelines to take oil to the refineries, the US was set for the most stunning industrial development of all time. The century of the automobile saw the concentration in the Great Lakes region of the world's dominant industry. With the steel mills at Gary, Indiana, the oil refineries at Cleveland, Ohio, rubber tyres from Akron and glass windows from Toledo, as well as the buggy-making skills from Columbus, the mass production of motor cars was concentrated in a small area with excellent low-cost navigable waterways. The flood of migrants from Asia, Africa, central America and Europe, as well as from the eastern seaboard of the USA, merely provided the labour and the customers for the motor-car.

Detroit, at a critical narrow gorge in the middle of this area, became the epicentre of the industry, the Motor Town, Motown. The largest American car companies were started in Detroit, Ford, General Motors and Chrysler. Their products symbolised America. The word *détroit* in French means *narrows*, or *strait*, the ideal location for a tax-collector's castle, the ideal place to drag a floating chain across the river to enforce taxes on passing trade, the ideal place to build a bridge. The irony is that Detroit did not tax the passing trade, but provided a valuable product to justify its sale price. Detroit and its product, the motor-car, symbolise the end of feudalism, of pernicious tax collection. If America provided the tax-free tax territory, it was Detroit that provided the equivalent of the horse. Everyone could now motor about, safe in their armoured splendour, impervious to bows and arrows, like a knight of old.