

# MAINE STATE LEGISLATURE

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# DOCUMENTS

PUBLISHED BY ORDER OF

# THE LEGISLATURE

OF THE

STATE OF MAINE.

1867.

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AUGUSTA:  
STEVENS & SAYWARD, PRINTERS TO THE STATE.  
1867.

NATURAL RESOURCES AND THEIR DEVELOPMENT.

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MEMORIAL

OF

HIRAM F. MILLS,

CIVIL ENGINEER,

TO THE

GOVERNOR AND COUNCIL

OF

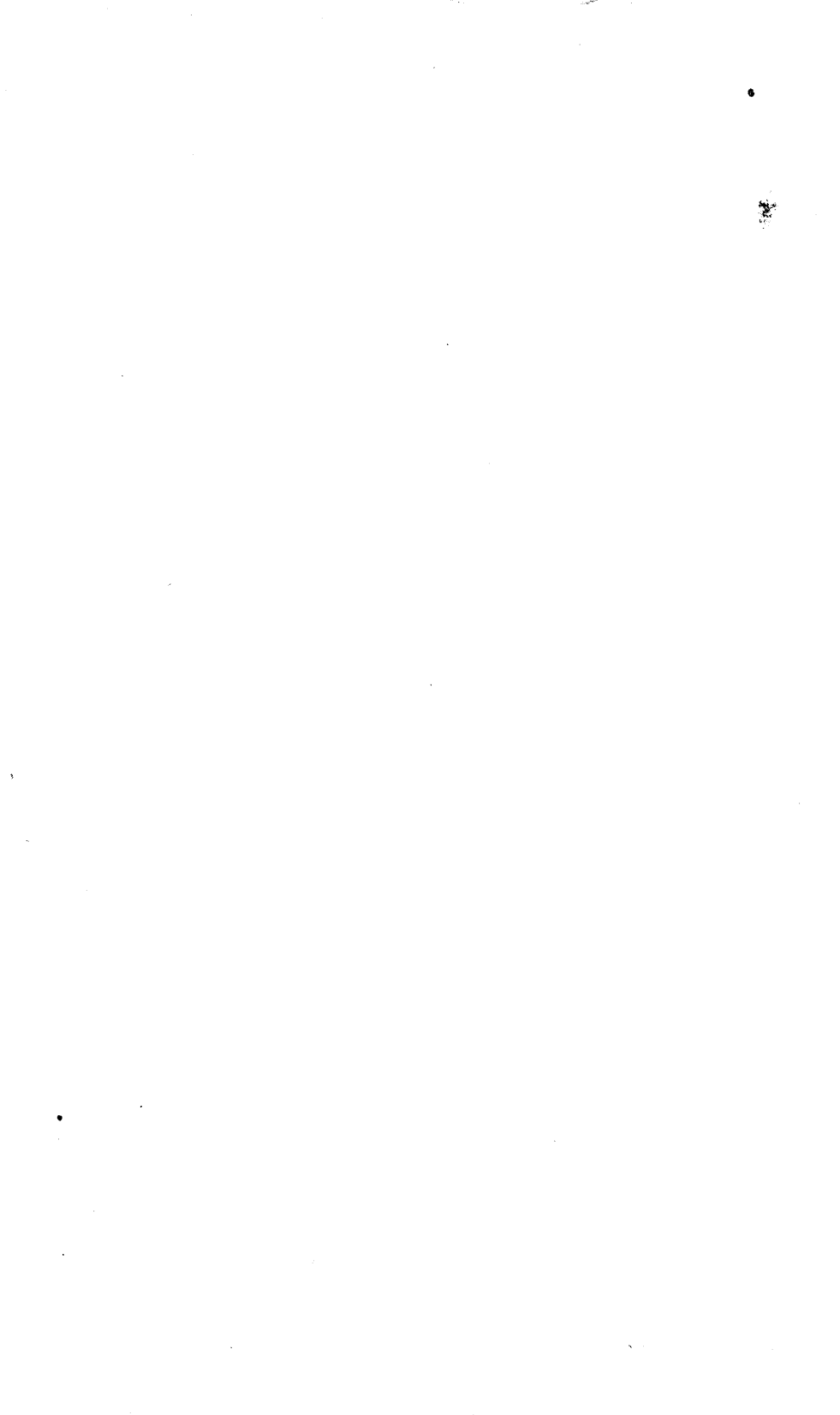
MAINE.

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# MAP OF THE UNITED STATES OF AMERICA.

TO ACCOMPANY A MEMORIAL TO THE  
**Governor & Council of Maine**  
 By Hiram F. Mills C.E.

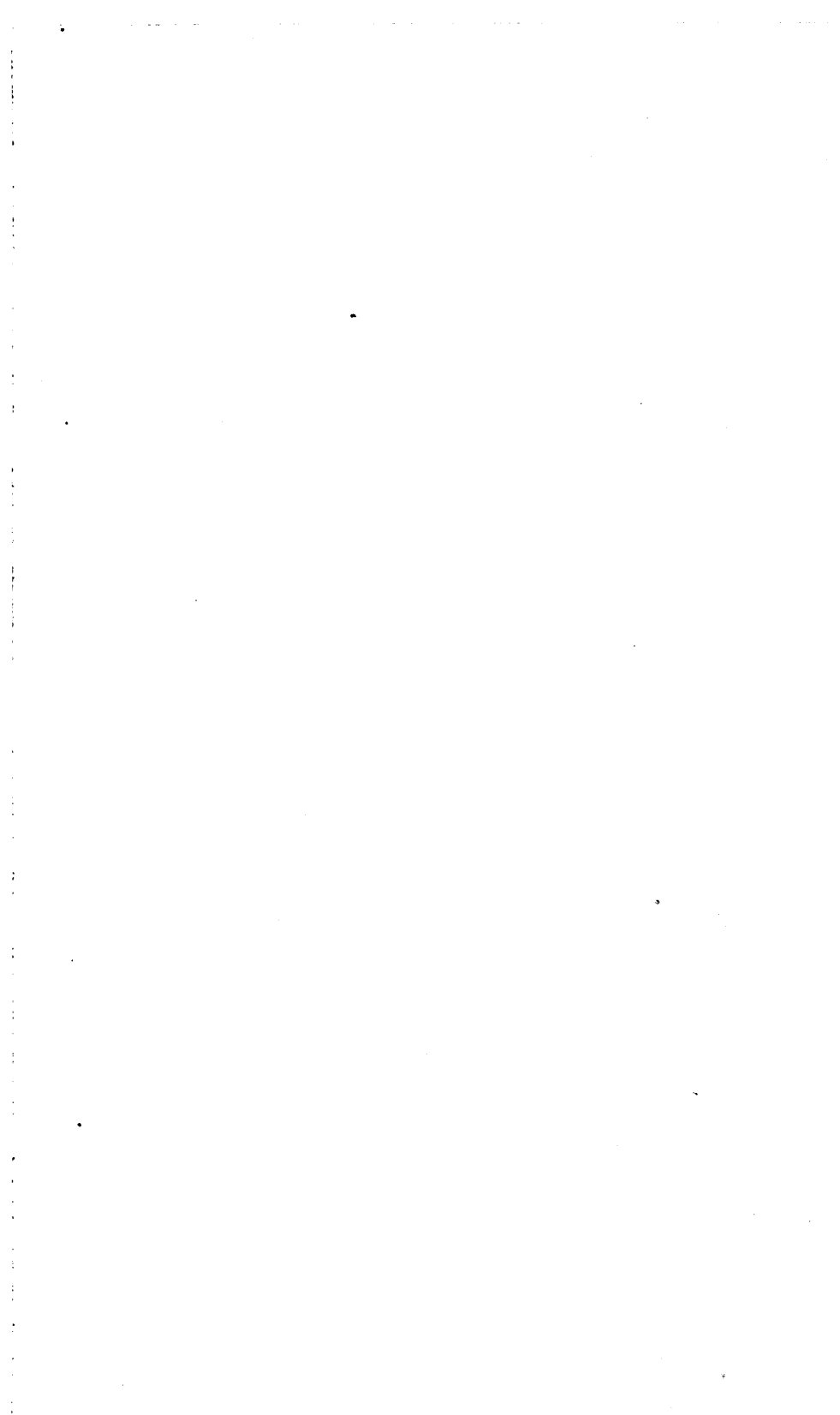
**Explanation.**  
 The Area indicated by color includes all of the WaterPower of the United States east of the Rocky Mts. The portion of this Area affording WaterPower which, from extent and accessibility, is available for Extensive Manufactures is distinguished by the deeper tint.

**Maps of Every Description to accompany Reports, Prospectuses, etc. Drawn, Engraved, Printed & Colored at G.W. & C.B. Colton & Co's Map Establishment 172 William St. New York.**

SCALE OF STATUTE MILES 69.16 to 1"  
 0 50 100 200 300 400  
 200 Geographical or 230.53 Statute Miles to one inch.

Entered according to Act of Congress, in the year 1860 by J.H. Colton in the Clerk's Office of the District Court of the United States, for the Southern District of New York.





## MEMORIAL.

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*To His Excellency* JOSHUA L. CHAMBERLAIN, *Governor of Maine,*  
*and to the Honorable Council :*

GENTLEMEN :—Believing that the prosperity of our State depends upon a proper appreciation by her people of her resources, and upon the development of them, I have prepared the following memorial upon the subject, which I submit for your consideration and for such use as you may conclude will conduce to the public good.

While engaged professionally, during the past eight years, in connection with the manufactories of Massachusetts and New York, and in connection with some of the principal lines of communication between those States and the West, the enormous expenditures which have been and are continually being made in those States to increase the amount of their manufactures, and the confidence with which they remove the structures which within your recollection were considered ample and sometimes extravagant, to rebuild upon a broader foundation and on a grander scale, with a permanence hitherto unknown in this country; and the persistence with which the broader minded men of the commercial and manufacturing centres of the Atlantic coast are investing millions annually in improving the means of communication with the West, have caused to arise questions of expediency, such as these : What is there in the present condition or future growth of our country that warrants this almost unlimited expenditure? What inspires the confidence or maintains the persistence of these men who have been both the pioneers and the supporters, and have received the reward of former like enterprises?

In seeking answers to these inquiries, let us examine some of the items of expenditure by which the five commercial centres of the coast have been connected with the country beyond the mountains.

The first cost of the Baltimore and Ohio Road was something over \$18,000,000.

The through routes connecting Philadelphia with the Ohio have cost \$42,000,000 ;

Those through New York State, connecting New York city with the West, \$120,000,000 ;

Those connecting Boston with the Hudson River and with the St. Lawrence, \$50,000,000 ;

And Portland has expended \$3,000,000 to connect her harbor with the St. Lawrence ;

Making a total of \$215,000,000 which has been expended by the Atlantic States upon routes of communication from the five commercial centres, Baltimore, Philadelphia, New York, Boston and Portland, through the mountains to the border of the interior basin of the country.

There was in 1860 a capital of \$400,000,000 invested on the Atlantic slope around these commercial centres in manufactories which are driven by steam or water power ; and a capital of \$200,000,000 invested in manufactures which require little or no steam or water power. These two classes of manufactures, though quite intimately connected, are to some extent separable, and in comparing the manufactures of different sections of the country, I shall confine myself to those that require power.

It is remarkable that nearly all of the \$215,000,000 expended on routes to the interior, together with large sums which have been expended on routes *through* the interior, has been furnished from the country bordering the coast, and a large proportion of it from the immediate vicinity of the commercial centres. There have been two main objects in this expenditure. The one most prominently before the projectors and the public has been an outlet from the interior, a means by which the surplus products of that great field may be supplied to the world, and incidentally, that the products of the world may be supplied to the interior. This was the main object and the profits expected therefrom the real inducements which caused the expenditure of this enormous amount of money. It was expended by commercial men and in the interests of commerce. This was and still is the main object of such expenditures, but another object, which was at first small, has been growing in importance, and now enters prominently into the discussion of schemes for connecting the Atlantic slope with the interior.

As the interior is becoming more thickly settled and its resources and wants better known, the interdependence of the different



sections of our country are becoming manifest. The interior is found to be fitted to supply a great surplus of food, both vegetable and animal; a great variety of metals and minerals, and most of the vegetable productions used in the mechanic arts. The eastern coast region also supplies these articles, but to an extent so limited and at so much greater cost, that the surplus of the interior can with more economy be transported to the coast for consumption. With this view our coast region is left the debtor of the interior; we are living upon their produce, and the more we grow the more complete will be our dependence upon them. This is the view that fills the public eye, and this view is at the foundation of the feeling of mingled disregard and sorrow with which hundreds of thousands of the natives of the coast region have left their homes to improve their condition in the interior. It is that we may compare this view with the whole truth that I shall present you with some of the results of my investigations.

The resources of the interior *are* enormous. We can well join with our countrymen there in the satisfaction, yes, the pride, that so large a part of our country is so exceedingly productive,—that whatever our demands may be upon the products of the world without, we shall have a surplus of our own products to exchange. But in making this exchange, in what does the interior depend upon the eastern coast? She depends essentially and almost entirely upon it. Why? Cannot the interior reach the world with more economy through her great rivers? Let the course of trade in 1860 give you answer. Wheat, flour and pork, may be taken to represent the articles of Western produce exported from the country. Of these articles the five commercial centres of the East exported \$56,000,000 worth, while there was exported from the mouth of the Mississippi but \$166,410 worth of these articles, being but one-sixth of the amount exported through our own city of Portland.

It is probable, however, that the then approaching war lessened the amount exported from the mouth of the Mississippi; but in 1859-60 when there was no disturbance of the trade by that route, the value of these articles exported was but \$586,943, being a little over one-half that of Portland for 1860-1, and but little over one per cent. of that from the five commercial centres of the East.

This exclusive use of the paths through the East in the present condition of the interior, shows the wisdom and foresight,—the ground of the confidence with which capital has been invested in

these routes; and as the products and wants of the interior increase with its population, its intercourse with the world will continue to be through these paths, and can only be turned in another direction by the inadequacy of these routes to supply their wants. This, then, is one entry to be made in the account to the credit of the East; and though it does not decrease our dependence on the interior for our produce, it does form one considerable source of the dependence of the interior upon us. Because of it, her prosperity depends upon our railroads and canals, our harbors, our ships, our ship-building and our sailors. Let us then for these interests welcome the growth of the West and increase our own prosperity as well as her's by improving the existing routes, encouraging a healthy competition, and with a wise foresight increasing the facilities of transportation with the rapidly increasing demands which the unprecedented growth of the West is making.

It may seem to you extravagant, but we are surrounded by objects the prediction of which has before appeared to you extravagant, and it will depend upon political changes upon our borders, as well as upon the spirit of our own people in developing their resources, but I think some of you may yet live to see the produce of the West passing through Maine in a canal. When from lack of better accommodation the ores and provisions from the interior seek New York through the Champlain Canal, then may Maine invest her capital in a canal which will bring these products by a route 30 miles shorter to a harbor which is 250 miles nearer to Europe. Or when the European & North American Railway shall be completed, then may Maine look out a route for a canal that will bring to her centre the produce of the West that she needs, and supply to the Eastern Colonies the large amounts which they now receive through New York.

The relation of the eastern coast region to the interior viewed as the path for its commerce with foreign countries, and as the consumer of a large part of its surplus produce, is the relation which is now most prominently before the public; but there is another relation, affecting vitally, both the coast and the interior. It is a relation due not only to position but to this, together with natural resources, resources by virtue of which a small tract of country, a tract not exceeding in area 70,000 square miles is and forever will be the seat of nearly all of the elaborate manufactures requiring power which will be required by the future growth and development of an area covering at least 1,800,000 square miles,

and which will within twenty years contain a population of forty millions. It is this relation, conceived to a greater or less extent, which has given confidence to our clear-headed eastern manufacturers, which has prompted some of them to tear down their structures built within thirty years and rebuild upon a scale limited only by the power at their command. It is largely to the increased growth and development of this enormous interior and southern area that the product of the manufactures of the east increased from \$720,000,000 in 1850 to \$1,260,000,000 in 1860.

I have said this relation is due to peculiar natural resources. Before proceeding to examine to what extent the resources of the eastern coast region are peculiar, let us call to mind the conditions essential to successful manufacturing.

The variety of material and of manufactured articles required in conducting any extensive manufacturing establishment can hardly be appreciated by one not directly engaged in their purchase, and the more nearly the products of the establishment approach the articles for immediate use by the people the greater becomes this variety; and it may be distinctly stated as a general truth and taken as a premise essential to safe deductions, that no section produces all of the raw material and the manufactured articles which are required in conducting any one of the elaborate manufacturing establishments which produce articles for consumption by the people.

It is also true that in a section which contains the power, and which produces in abundance the principal raw material used in the simpler manufacturing processes, such as the grinding of grain or the sawing of lumber, the value of the products of these processes depends to a great degree upon the facilities for transporting these products to those sections which do not produce them.

The value of any place for the establishment of manufactories requiring power depends upon these conditions:

Economy of power:

Economical connection with the sources of the principal raw material to be used;

Economical connection with manufactories which will supply the required manufactured articles; and

Economical connection with commercial centres, which will supply the lesser, but generally indispensable raw materials imported, and at the same time furnish a market for the products of the pro-



posed manufactories, from which they may be distributed to the world.

These being the general conditions essential to success, let us examine their relative importance and endeavor to arrive at the money value of such of them as can be so expressed.

The cost of power depends, if from steam, upon the first cost of engine and boilers set ready for work, the annual cost of repairs and periodic renewal of important parts and the cost of fuel, supplies and attendance. If from water it depends upon cost of dam, canals, races and gates, upon wheel-pits and wheels, and upon the annual cost of repairs and attendance.

It would properly be considered a very expensive site for the development of water-power at which the first cost of all of the works, including wheels and wheel-pits, would equal the first cost of steam engines, foundations and boilers set ready for work, which would furnish the same amount of power; but, not to present too favorable a view of our own possessions I will estimate the first cost of each the same.

The difference in cost of power from the two sources will then be the difference in the annual cost of repairs and renewals of each, the difference in cost of attendance and in the extra cost of fuel for the steam. These differences can be determined only from experiment, and as the most reliable data have been obtained from the use of the two kinds of power in pumping water to supply cities, I will cite some of the results thus obtained.

The cost of running the nine wheels of the Philadelphia Water Works, including the cost of running the pumps, in 1852, was for the year, at the rate of  $2\frac{3}{4}$  cents per day for each horse-power of work done. This cost includes all repairs to them, oil, tallow, packing, wages of men attending them, and fuel to prevent their freezing in the winter.

From experiments made upon the steam pumping engines of Brooklyn, Hartford and Cambridge, under the best circumstances, I find the cost of coal at \$6 per ton, was 10 cents per day for each horse-power of work done. In ordinary working order this cost is from 10 to 15 cents per day per horse power. If steam at this rate were used upon engines of 100 horse-powers each, the cost per day for attendance, repairs, renewals and supplies would be 10 cents per day per horse-power; making the total cost of running, attendance and repairs to produce power by steam by the best steam engines, from 20 to 25 per cents per day per horse-power;

and to produce power by the best water wheels from 2 to 3 cents per day, making a difference in favor of water-power of 20 cents per day per horse-power, when coal is \$6 per ton; and a difference of 15 cents per day per horse-power in the vicinity of coal mines where coal can be obtained at \$3 per ton. Applying this value to the power used in Massachusetts in the manufacture of cotton goods in 1860, where was used water-power to the extent of 40,000 horse-powers, there was a saving in one year of \$2,480,000; a sum which would pay for the transportation of the whole amount of cotton used, in that State, a distance of 7,000 miles along the coast, rather than to have it manufactured by steam at any of the harbors near where it grows.

The cost of manufacturing cotton goods in New England in 1860, by water-power, was \$6,000,000 less than it would have been if steam-power had been used. This sum is 15 per cent. of the value of the raw material used in these manufactures, and equivalent to 36 per cent. of the total cost of labor in these factories. Or to make another comparison—if cotton were grown in the neighborhood of Pittsburg, Pa., it could be carried 600 miles by railroad to a water-power and the cloth returned to Pittsburg as cheap as it can be manufactured there by steam, provided that other conditions of manufacture are as favorable at the water-power as at Pittsburg.

For the manufacture of light articles including all kinds of fabrics, *economy of power* is the principal condition which determines the value of a locality; next to this is the economical connection with other manufactories; then economical connection with a commercial centre, and lastly, especially if upon the sea-coast, economical connection with the section producing the raw material. For the manufacture of articles from a heavy raw material, the relation of these conditions is changed. Then it is important to have the power and the raw material in the same vicinity.

In the first processes in the manufacture of metals, it is sometimes more advantageous to use steam-power in the immediate vicinity, than to carry the metal a short distance to a water-power; but this is true only of the first processes which require little power compared with the weight of material.

Pittsburg, Pa., presents the most economical connection of the raw material, iron and steam-power, and from their juxtaposition springs the great success of that place. But even there, with coal

at their very doors, the manufactures of iron and steel are confined almost exclusively to the simpler processes which require great weight of material in proportion to the power expended, and which serve to prepare it for more elaborate manufacture elsewhere.

By the returns of 1860, the value of the whole product of Allegheny county, including Pittsburg, of articles composed of iron and steel, which required power in their production, was \$7,000,000, and of this \$3,761,000 was in bar, sheet and railroad iron; and \$1,691,000 in nails, spikes and railroad chairs. More than 75 per cent. was confined to these simple processes, while in the more elaborate manufactures, such as cutlery, this county does not produce a dollar's worth; and on the other hand, we find the largest manufactory of cutlery in the United States, using the water-power among the mountains of western Massachusetts. In fact, the whole of western Pennsylvania, covering an area greater than the whole of Massachusetts, and furnishing iron and coal with more economy than any other section of the country, manufactures articles composed entirely or mostly of iron and steel, which require power in their production, whose value is but 42 per cent. of the value of articles manufactured of iron and steel in Massachusetts.

This great difference in favor of Massachusetts is not due *entirely* to her cheap power, in fact a *small part* of her iron manufacture is produced by steam, and the *whole* is due to the combinations of the conditions favorable to successful manufacturing; but these conditions are based upon, and have grown entirely from, her position, her cheap power and the spirit of her people.

Now keeping in mind the value of water-power, as compared with that of steam-power in the manufacture of textile fabrics, and in the more elaborate manufactures from heavy material, and not losing sight of the other conditions necessary to successful manufacturing, let us compare the resources for manufacturing of the coast region with that of the interior; let us see to what extent the resources which have been supplied to us in abundance, and which we of Maine so commonly allow to run to waste, are shared by our countrymen in other sections.

The whole area of that part of the United States which lies east of the 23d meridian which passes through the western part of Kansas, is 1,500,000 square miles. I have represented by faint shading upon this map the part of this area which is at all adapted to furnishing water-power for manufacturing purposes. It includes the whole of New England, New York and Pennsylvania, Northern



New Jersey, Western Maryland, Western and Middle Virginia, Western North and South Carolina, Northern Georgia and Alabama, the Northeastern corner of Mississippi, Eastern Tennessee and Kentucky, and a strip through Central Ohio, a part of Michigan, Northern Wisconsin, the whole of Minnesota, a part of Dakota and of Iowa, Western Missouri, Northwestern Arkansas, and a part of Texas.

This region borders upon the sea through New England and Southern New York; south of this it recedes from the ocean, but is easily approached by the great bays Chesapeake and Delaware, as far south as the James River, in Virginia. South of this river it is separated from the ocean by the broad flat country which extends back from the coast a distance of from 60 to 150 miles, a region presenting but few good harbors, and with rivers offering so poor facilities for uninterrupted navigation as to deprive the region of water declivities of these important conditions of success in manufacturing, namely, economical connection with a variety of raw material and manufacturing and commercial centres. It is true, these wants can be supplied to some extent by railroads, but the railroads must be built for this special purpose because the water-falls are not on through routes of travel connecting rich producing countries with commercial centres upon the coast. The water falls are in the rear of the country which supports the commercial centres of that region. There are other conditions, principally climatic, which affect the use of the water-power of this region for extensive manufacturing establishments; but I think enough have been presented to show that it will never compete with the region of water-power on the coast, and will be used only for the manufacture of local products for local purposes.

Following the region of water falls around the end of the mountain range and up through Eastern Tennessee and Kentucky and Western Virginia, the most prominent characteristics presented are its entire separation from the sea and the greater part of it being distant from any of the great routes of travel connecting the interior with the sea. Upon closer examination, it will be seen also, to be nearly destitute of any of the large navigable rivers, not because some of these have no falls, but because the great areas which they drain pour into them during part of the year such quantities of water and increase the height to such an extent as to inundate manufacturing establishments so placed that they could make use of the water-power during the drought. There remain,

then, of this region, the smaller streams and the parts of the larger rivers near their source.

But now appears one of the compensations which we of the granite region of the East are more ready to see in the circumstances of others than of ourselves. We live upon a soil which has been made up of and has come down from the granite country of the north and northwest. Our neighbors on the other slope of the mountains pride themselves upon their broad slopes, adapted to grains and grasses, which are made up of and rest upon a foundation of limestone. The consequence is, that while our rivers are flowing through the year with unusual regularity, their porous soil conveys the rainfall directly into their streams, swelling their rivers to an enormous size for a time, but leaving them excessively dry in a time of drought. This condition renders their streams of little value for manufacturing purposes, and in connection with their isolated position, excludes them from becoming the seats of any extensive manufacturing establishments. They will never be used except for the manufacture of local products for local use.

We now enter the region included in Western Pennsylvania, Western New York and Central Ohio. This region partakes to some extent of the peculiarities of that just left, but it differs in being traversed by the great through routes connecting the interior with the coast. These give value to its power, which is now used to a considerable extent, and it will grow in value as the products of the country around it increase. The rivers of this region which flow into Lake Ontario, are now largely used in flouring the grain of the vicinity as well as much from the West which is passing through to New York; and wherever it is accessible from the travelled routes, the power of this region will be used for the purpose of manufacturing the products of the country around it, both for local purposes and for transportation; and within a limited distance from these routes it will be used for the manufacture of articles composed principally of the products of the vicinity, but in part of products of other regions brought for the purpose.

Moving westward we find a strip of land in the southern peninsula of Michigan, of limited extent, and generally removed from the lakes, being the slope that exists between the flat table land of the interior and the level shore region. There are a few points in this strip that furnish valuable water power, and these will be used entirely for the manufacture of the products of the immediate vicinity.

The northern part of Michigan bordering Lake Superior, owing to the great height to which the land rises from the lake, furnishes an abundant power, but the entire want of good harbors will prevent the use of this power except for local purposes.

Passing on to northern Wisconsin and Minnesota, we find a country abounding in water-falls, resembling, in this respect, the northeastern coast region, but because of the small amount of rain—there being but two-thirds of that upon the coast—the great evaporation and the character of the soil, which allows the rainfall to pour directly into the streams, it is found that a river must drain a very large area to furnish the requisite power for extensive manufactories in the time of drought. These conditions exclude the falls upon the smaller streams and those upon the upper part of the larger rivers for use excepting for the simpler processes of manufacture of local products. Following the larger rivers to their mouths, many rapids are found made up of loose material, which will make the construction of permanent dams so expensive as to leave these sites unimproved until all others in that region are occupied.

The valuable water-falls of this whole region are then confined to the few rapids on the large rivers which present ledge bottoms; these are included in the dark shading upon the map, and are found principally on the Menomone and Fox rivers flowing into Green Bay; the Wisconsin, Black and Chippewa and St. Croix rivers flowing into the Mississippi from the north; the Knife Rapids, the Sauk Rapids and the Falls of St. Anthony, on the Mississippi, and the falls of the north or main branch of the Minnesota river.

These rivers, within the narrow district represented upon the map, present sites for manufactories which for cheapness and amount of power compare favorably with the valuable localities on the eastern coast, and they are to be the source of great wealth to the north-western country. They will be used in manufacturing the products of a very large area, but being situated so far inland, and being to the north of the principal routes of commerce through the country, their manufactures must be limited certainly, until there is a great demand for manufactured articles to the north and west of them, to the working up of the raw material that is produced within a range of 500 miles. This will give them abundant service, and will be of incalculable benefit in the development of the interior, and without interfering materially with the future interior market of eastern manufactures, it will make a community of



interest, which will always coöperate with the East in maintaining a policy of the general government, which will tend to preserve the manufactures of the country from the fluctuations caused by party and sectional feelings and interests.

Passing down the Mississippi river, we find, near Rock Island, rapids at which in a distance of 14 miles the fall is  $25\frac{3}{4}$  feet, and farther down, a little above Keokuk, the fall in a distance of 11 miles is 24 feet. These rapids are over ledges upon which dams can be built and very valuable water-power can be developed. These are the only rapids on the Mississippi below St. Anthony's Falls which can be made useful for manufacturing purposes.

In the central part of Iowa, numerous rapids are found which present for local purposes water-power which is valuable. Of these the few which are upon a ledge and which will furnish a permanent power through the drought, will be required for manufacturing the local products of the vicinity, and will never compete with the water-powers of the East in supplying the general market.

Passing southerly, we find water declivities in south-western Missouri, north-western Arkansas, and a few in Texas. In these sections the streams which are at all adapted to manufacturing purposes drain small areas and supply during the drought little, and in some cases no water; they are adapted only for the manufacture of the products of the immediate vicinity and limited in these to the simpler processes which require little machinery and few skilled operatives. Their ability to supply the market with articles of elaborate manufacture is insignificant.

We have now examined all of the area furnishing water-power which can be used to any extent for manufacturing purposes. It is all embraced in an area of 500,000 square miles, and of this the only valuable part for extensive manufactories is confined to the eastern coast region, to a limited distance each side of the through routes connecting the East with the interior, and to a district drained by the Mississippi and its branches in northern Wisconsin and Minnesota and in eastern Iowa.

Of the eastern coast region a part only is valuable; for a part being among the mountains, it can be approached with difficulty, and the area drained there is generally so steep and rocky as to shed the water directly into the streams and leave the quantity drained in time of drought so small as to be of little value, hence this part must be omitted from an estimate of the valuable water-power of

the country ; and by careful examination it will be found that the whole water-power of the country east of the great plains, which can ever be used for extensive and elaborate manufacturing establishments, is included in northern Wisconsin and Minnesota and eastern Iowa, covering there an area of 25,000 square miles ; and in a district on the coast from James River on the South to the St. Croix on the East and extending back fifty miles from tide-water ; and strips along the routes of through travel included within a distance of ten miles on either hand ; including in the East 70,000 square miles and in both East and West 95,000 square miles, or but 5 per cent. of the whole area depending upon them for manufactured articles.

The sections of the country which are included within the limits just described, are represented upon the map by the darker shading ; and to this, which presents at one view the relative position, the relative magnitude and the interdependence of the producing and manufacturing districts of the country, I wish to call your especial attention. Look at it until you can carry it in your mind, and when in quiet moments you are led to think what relation your own homes and the industry which surrounds you bear to the prosperity of the country, or when projects for the development of an increased industry are presented, call up before you the conditions here presented and establish your judgment upon a view broad enough to include the present condition and future growth of your whole country.

In comparing the view here presented with the actual condition of manufactures requiring power, in the present or in the future of our country there is one circumstance which deserves attention. It will be found that a considerable power is used and manufactured articles to a large amount are produced within the limits of large cities ; and this will be found to be the case independently of the cost of power.

These manufactures consist of the requirements of commerce ; of the more bulky articles of use for the immediate vicinity, and of articles of taste and ornament somewhat peculiar to the inhabitants. Steamboats, locomotives and cars must be repaired at or near the end of their routes ; these repairs get to be so various as to require all of the skill and machinery necessary in the original constructions, and it becomes economical to convert establishments which are essential for maintenance of transportation into establishments of construction.

The same is true of the machines necessary in the construction and maintenance of great public works and those necessary in procuring, storing and preparing the products which seek that centre. So also with the more bulky articles of household furniture, these can be manufactured and repaired with more economy in the city, even with great outlay for power and rent than they can be transported from a distance. Food, also, from the field can be prepared with more economy between the field and the consumer than it can be transported many miles to cheap power. But these manufactures are not included in those for which the water-powers of the east are noted, and their growth will never interfere with the market for which these are in so great demand, viz., the elaborate manufacture of articles required in all markets, which can be produced in large quantities and transported great distances without increasing materially their cost to the consumer.

With the physical characteristics of the country which have been presented before us, let us examine the actual condition of manufactures in the country before the war. By the census returns of 1860 the value of articles manufactured, which require power in their production, in the whole of the United States east of the Rocky Mountains was \$872,000,000—of this, \$600,000,000 was manufactured in the region of water-falls bordering the coast and colored dark upon the map, leaving but \$272,000,000 as the product of such articles in the whole area outside of this region; and of this \$272,000,000, \$199,000,000 was produced in the simple processes of grinding grain and sawing lumber—leaving but \$73,000,000 as the product of all other manufactures requiring power in the whole area outside of this narrow district on the coast, while in this district the product of other manufactures requiring power is \$470,000,000; that is, 86 per cent. of the more elaborate manufactures requiring power in the United States east of the Rocky Mountains, is produced in the district of water-falls on the coast, and but 14 per cent. in the whole area outside.

Comprehending as we now may the relation which this limited region of valuable water declivities has to the prosperity of the country, we may with profit return to it and examine it with more care, and from its past history and present condition determine its present value and to what extent the country can rely upon it to supply its demands in the future.

In 1820 the value of the manufactures of this region was about \$100,000,000, with a capital invested of about the same amount.

In 1850 the whole value of manufactures of this region was \$720,000,000 with an invested capital of \$400,000,000—an increase in thirty years of over six hundred millions dollars in the value of the annual product. By the last census we find that in the ten years from 1850 to 1860 the increase in value of the annual product of this region was from \$720,000,000 to \$1,260,000,000, or 75 per cent. in ten years.

The total capital invested in this region in 1860 was \$686,000,000; and from partial returns of the past year it may be concluded that the increase has in no way diminished in the past six years even when the returns are reduced to a gold basis. This surprising increase will indicate with what rapidity the water-power of this section is being brought into use. Nearly all of the best localities,—those furnishing a large quantity of water in the drought, which are in the vicinity of the old commercial centres,—are occupied, and many of them have used up all of the power at their command. This is the case with many in Connecticut, Rhode Island, and in eastern Massachusetts. The capitalists who have succeeded there with such unusual success are now looking around them for localities which, with the increasing demands of the country, present the essential conditions for success in the future. They are confined in their search to the small area represented upon the map. The central portions of this area which skirts the coast are already occupied, and in a few years the limit of their capacity will be reached. There still remain accessible by tide-water the districts of Maryland and Virginia on the south and of Maine on the north-east, whose water declivities are but beginning to perform their part in the great economy of our country.

As one of the results of the war, the localities of Maryland and Virginia will be open to the entrance of skilled labor and to competition with those of Maine. But though the former have the advantage of position, in being near to the interior, Maine has the advantage of at least a generation in the character of her citizens, in her public schools, and in the energy and skill with which her people apply themselves to mechanical pursuits; and she is soon to take her place—and because of her position, her excellent harbors and her abundant power, her place will be a very prominent one among the manufacturers of the country. The time has now come when it will depend upon her own people whether her resources are to await the actual necessities of the country, and are

then to be accepted as a last resort, and used entirely by capitalists from abroad, who, having no interests but those represented by the annual dividends, omit the care which every manufacturing corporation should have over its operatives, and allow to grow up in the best part of our State degraded communities of paupers, such as have grown up in many of the great manufacturing localities of England. It will depend upon her own people whether this shall be the result, or whether her capital shall be used in the development of these resources, in presenting them in a form the most inviting to the speedy coöperation of capital from abroad, and in sharing with that capital the fruits of their own enterprise; and with a wise oversight for which America alone furnishes examples, building up all over our State communities at once industrious, intelligent and independent; communities of men skilful and loyal; communities like those which at the first note of national danger supplied the men who within twelve hours from notice left their business, joined their regiment, and were on their way, the first to receive the shots of rebels when marching to defend the Capital.

In examining the resources of our State for the purpose of determining the manner in which our capital can best be used in their development, an examination of the experience of such enterprises in other States will be valuable.

When the power-loom had been introduced at Waltham, on Charles River, it was found after a few years that the power there supplied was not sufficient to allow the desired expansion of the business, and in 1821, the capitalists there interested, Messrs. Nathan Appleton and Patrick T. Jackson, started on an excursion to discover a suitable water-power for the recommencement of operations on a larger scale. They examined several localities in eastern Massachusetts and in New Hampshire, passed the Nashua River, and not knowing the extent of the fall which has since been made the source of so much power by the Nashua Company, and seeing there but a small grist-mill with a dam six or seven feet high, they returned, without finding a place suitable for their purpose.

Soon after, Mr. Appleton was at Waltham, and his superintendent told him that in talking with his former partner upon the subject, he had said, "Why do they not purchase the land around the Pautucket Falls in Chelmsford? They could put up as many works as they please and never want for water."

Upon examination, they found that there was the whole power



of the Merrimac upon a fall of thirty-three feet. This was thought to be ample, and the privilege and the adjacent lands were immediately purchased. This was in December, 1821. On the 5th of Feb., 1822, an act of incorporation was granted, and in the opening Spring operations were commenced and prosecuted with the utmost vigor; and on the 1st of Sept., 1823, the first wheel of the Merrimac Company was set in motion. The first dividend of that company was made in 1825, and with few exceptions they have been continued regularly, averaging something over twelve per cent. per annum to the present time.

Other corporations were formed in 1825-28-30-35, and the last in 1839, when it was found that in time of drought no more power could be supplied than these establishments required; so that here in the short space of seventeen years, the power of this great river, upon the unusual fall of thirty-three feet, which was in 1821 thought to be such that they would never want for water, was entirely used and the sale of power stopped. They then found that to provide for an increase in their business, it was necessary to increase their power; and for this purpose, the Winnepisseogee Lake Cotton and Woollen Manufacturing Company was incorporated, with a capital of \$100,000, which in 1846 was increased to \$1,000,000, and their powers extended to the improvement of the water power of the Winnepisseogee, Pemigewasset and Merrimac rivers. Under this charter, ten dams were built, and water surface of one hundred square miles placed under the control of the manufactories down the river. It was found at this time, 1846, that the increased number of wheels used by the factories as their business increased, caused an increased current in the canal, and a consequent loss of head of between two and three feet at the wheels. This canal had at the start cost \$120,000, and was then considered ample, but now to save this head of two and a half feet, which was but eight per cent. of their whole fall, they considered it economy to build another canal a mile long at a cost of \$500,000, which they according did, completing it in 1848.

The power at Lowell being used to such an extent that no new corporations could be formed, Lawrence was started, and a dam with a canal on one side of the river was completed in 1848 at a cost for construction of \$500,000, and the power that could be furnished by that canal being used, a new canal was started on the other side of the river during the past year.

About the same time other water powers were developed further

removed from commercial centres, and now in our own State the power at Saco and Biddeford is used to such an extent as to raise questions of the priority of right and the most equitable method of adjusting them.

I have cited these examples to impress upon your minds that abundant as our water power seems, it is not without limit, and also to show the great advantage of having the largest possible amount of power at command wherever extensive manufactories are to be established.

When the great expense of establishing dams, canals, mills and machinery has been incurred and their operations commenced, it requires but a small additional expenditure, and but little difference in the organization and running expenses to largely increase the product of manufactures.

Manufactories will be established to meet the present demands, and when their business is well established, and with the growth of the country and the improvement in the quality of their goods, the demand increases, they will gradually introduce new machinery, extend their buildings and require more power, and if limited in this, they must either introduce expensive steam-power, or go elsewhere, leaving the auxiliary manufactories around them, which were perhaps essential to their success and begin anew. These considerations render localities furnishing great power much more valuable in proportion to the power supplied, than localities furnishing little power, and it is to the localities furnishing great power that the capital of our people should be devoted.

Advantage should be taken of the water declivities at and near the head of navigation on our great rivers, for the building up of great manufacturing centres, to which the smaller powers on the streams for several miles around will be made tributary and thus become of a value to which they can never attain by development on their own account.

I have shown you the reasons why localities furnishing great power are much more valuable in proportion to the power supplied, than localities furnishing little power; it is also true that the expenses attending the development of power on our great rivers are much less than would attend the development of the same amount of power on small streams. All considerations of economy, of sure and ample returns for the capital invested, for the creation of a value to the power which can be derived from our small streams; in fact, all considerations which affect the successful

development of the great resources of our State conspire to direct the capital of the State to the development of the great water-powers which are to be found at and near the head of navigation on our rivers.

Let us examine for a few moments, somewhat in detail, the amount of power, and its value compared with steam-power, that can be obtained from one of our principal rivers near tide water, and for this comparison I will select the Penobscot, because I have examined that with care and know what can be derived from it, and because it presents the conditions of economy of power; economical connection with the sources of raw material; economical connection with the commercial centres, and is yet to be a manufacturing centre itself upon which will depend all the smaller manufacturing localities for thirty miles around. On this river, within twelve miles from one of the very excellent harbors of the State, there is a fall of one hundred feet. Now for the purposes of an estimate, I will suppose this section swept clean of all of the saw-mills and dams now erected upon it. Permanent stone dams could then be built, together with the necessary canals, from which there could be supplied a power equivalent in the drought to 40,000 horse-powers at a cost for construction which would not exceed \$1,500,000. The cost of wheel-pits and first class wheels set and connected with the canals ready for work, would not exceed \$3,000,000. Making the total cost of dams and canals with all necessary appliances and of wheel-pits and wheels, set ready for the reception of the main shafting, not exceeding the sum of \$4,500,000.

The cost of steam engines of the best quality, with their foundations and boilers, set up, ready for the reception of the main shafting, of sufficient capacity to do the same amount of work continually would exceed \$6,000,000. Here then would be a saving of at least 25 per cent. on the first cost in favor of water-power.

The *annual* cost of supplying this amount of power by steam, will depend somewhat upon the cost of fuel, but taking the cost of fuel under the most favorable circumstances, at the low rate of \$2 per cord, which is as low as wood can be delivered ready to burn; if this amount of power were to be used in the midst of our forests, and at \$3 per ton for coal, if situated among the coal mines of the interior, at *these* rates the *annual* cost of this power, if produced by steam, would exceed its cost here produced by water by \$1,884,000. So that the power of this river, which can be furnished,

partly at tide water, and the whole within twelve miles of an excellent harbor can be furnished at a less expenditure for construction and at a saving of annual expense of \$1,884,000 over that of the most favored locality of the interior. And at a saving in annual expense of \$2,480,000 over what would be necessary to produce this power by steam, at the ordinary prices of fuel on the New England coast.

You have now before you some of the important relations which the position and resources of our State bear to our common country. It is upon these relations that her future prosperity will depend. The development of these peculiar resources does and always will make the interior dependent upon us of the east for nearly all of the articles of elaborate manufacture which her people will require; and to her increase must we look for the principal market for what we can produce. Let our resources then be developed with the rapidity which the unparalleled growth of the interior will require. We cannot do too much. The whole capital of the State, if turned in this direction cannot increase with the rapidity of demand the manufacturing facilities which will be required of sections of this eastern coast region whose resources are neither greater nor better in any respect than ours.

Seeing the increase in the manufacture of this region of seventy-five per cent. from 1850 to 1860, the increase in actual value of from seven hundred and twenty millions to twelve hundred and sixty millions; with an increase probably as great in percentage during the present decade, which would make the value of the manufactures of this region in 1870 the enormous amount of twenty-two hundred and five millions. Seeing this we can no longer be indifferent spectators, while our resources are running to waste and we are taking so small a part in reaping the reward which our advantages place within our reach.

Maine, with a position and resources which fit her to produce twenty per cent. of the manufactured products of the eastern coast region, did in 1860 actually produce but three per cent.

The increase in demand for the products of this region for the next ten years will probably require an increase in annual product of \$1,500,000,000, which will require an increase in capital invested in that time of \$700,000,000.

If Maine shall do the part which her position and her resources make it incumbent upon her to do, there will be invested within her limits in 1877 a capital of \$140,000,000 in manufactures, yield-

ing an annual product of \$300,000,000, and employing a population directly engaged of 250,000.

Foolish, indeed, would we think that State in the interior which should use its abundant resources only to supply its own people with the necessaries of life, and to satisfy the demands of the market which the most meagre connection with the people who needed her produce would furnish. Let us no longer follow a course so unwise.

Let the connections between the different parts of our own State be increased, and the connections of the whole with our market in the interior be multiplied,—and let us appreciate our resources, see their relation to the prosperity of our whole country, and turn our wisdom, our energy and our capital to the development of them. When this is done, and our prosperity is seen to depend upon our peculiar resources, and the development of them takes its proper place as the leading idea in the minds of our people and in the councils of State, then will her other interests,—her commerce and her agriculture,—increase in amount and profit as it is impossible to make them increase in any other way. No community so much as one engaged in manufacture, requires the help of commerce by land and by sea in supplying the raw material and the products consumed, and in carrying the manufactured articles to a market; and by the wants of such a community alone can a home market be made which will require the full development of the agricultural districts of the State.

HIRAM F. MILLS.

BANGOR, Feb. 21, 1867.