inadequacy of this space is at once apparent when it is understood that an ordinary towboat with its fleet of barges occupies more than one acre, so that at this rate there would be harbor-room for only 5 such fleets. There is an additional space between the bridge and the first dam on the Muskingum, which is situated 300 feet above the bridge, but as the bridge is only 42 feet in clear height above low-water, it is too low to permit the passage of any of the steamers, and were it higher the violence of the current below the dam when the water is passing over would forbid the use of much of this space.

It is therefore desired by the rivermen that a wider draw-span be placed in the bridge, and that a new lock be built at the dam large enough to pass the steamers with barges through to the pool above. This pool has a length of $5\frac{6}{10}$ miles to the second dam, with an average width of 510 feet, affording an area of about 350 acres. Our survey showed this pool to be of ample depth, so that steamers can approach the shores nearly all the way up to Devol's Dam. There is here, therefore, abundance of room for a first-class harbor of refuge.

CONDITION OF PRESENT WORKS.

The locks and dams on the Muskingum were constructed in 1838 by the State of Ohio. The slackwater extends to Zanesville, 65 miles, in which distance there are five locks. There are 5 steamers plying on the pools of the Muskingum, 4 of which form daily lines between Marietta and Zanesville, and between Marietta and Beverly, the fifth being employed between McConnellsville and Zanesville. In addition to the above, boats have for years made weekly round trips between Pittsburgh and Zanesville, and occasionally towboats, with coal and coke, ascend the river.

The city of Marietta, with 8,000 inhabitants, occupies the left bank of the river, at its mouth, and opposite to Marietta is the handsome town of Harmar, containing a population of over 1,000. In the location of the first dam a dispute arose as to the side of the river on which the lock should be established, which was finally settled in favor of Harmar. The location of the lock on the Harmar side was unfortunate, for the natural channel of the river is now and always has been down the east or Marietta side, which has a slightly concave shore. To remedy the difficulties attending the maintenance of the channel from the lock to the drawbridge along the Harmar side, there being a tendency of the river to form a deposit on that side, it became necessary to drive piles, so as to confine the waste water from the lock in a canal. After passing the drawbridge the channel, being no longer confined by the piles, turns almost at right angles to the Marietta side, and thence continues down that shore to its junction with the Ohio. It is said, by old citizens of Marietta, that in early days the mouth of the Muskingum was scarcely more than one-third of its present width, and that the "tall sycamores nearly interlocked their branches over its mouth," which was then for some distance up 16 feet deep along the Marietta shore. There is no doubt of the fact that the river was formerly much narrower at this place, for old Fort Harmar with its parade-ground occupied the site of the bar and the space between it and the Harmar bank.

The lock was constructed of masonry, with side walls 8 feet thick. The walls at their lower ends measure 19.1 feet in height above low-water surface in the Ohio. At their upper ends they measure 24.7 feet above the same datum, or 13.3 feet above the comb of the dam. The lift of the lock is $11\frac{1}{2}$ feet, the chamber being 180 feet long and 34 feet wide. The depth on the lower miter-sill is one foot less than the channel depth below and in the Ohio River, so that in periods of low-water it sometimes occurs that boats able to navigate the river below cannot enter the lock for want of a sufficient depth on the miter-sill. To obviate this difficulty recesses were left in the masonry of the piers at the draw-bridge, 280 feet below, for the purpose of hanging gates which, when closed, would pond the water in the canal and in the lock-chamber sufficiently deep to admit boats, but for some reason the gates were never put in place.

The masonry of the lock rests on planks which were laid on the gravel, no piles having been driven to support the foundation. As might be expected under such circumstances the scour created by leaks underneath this flooring has caused a settlement of the walls amounting to as much as 1 foot in the river-wall at one place. Several years ago, on account of the settlement, it was found necessary to remove about one-third of the land-wall and replace it with timber crib-work. The lock is so much out of repair and in such a condition that it may properly be called a ruin, though as the gates are kept in order and work freely it still remains of great value. The premature decay of such an important work is to be solely attributed to the too common practice of sacrificing stability for economy in first cost.

Originally the dam was constructed on the gravel in the same manner as the lock, and in 1866 200 feet of it washed out, but it is claimed that the accident was caused by the dam tumbling into the excavation created by the scour below and not by leaks underneath. However this may be, it is certain that pile-work foundations would not so easily have toppled over. The break occurred at a point beginning 60 feet from

the Marietta side, and it was followed by a scour which extended to the depth of over 20 feet in the gap. I was interested to know whether the scour had extended at that time to the bed-rock, but the evidence was conflicting on this point. The new portion of the dam rests on piles. Whatever may be the depth of the rock at this place, I am satisfied that it is beyond reach for economical construction upon it. The bridge-piers and the mills in the neighborhood all rest on piles driven to the depth of 16 to 18 feet through the gravel and sand, and have stood the test of time very well.

Considerable apprehension has been felt at times that a flood in the Muskingum might wash out the banks around the lock, or around the abutment on the Marietta side, an occurrence which has happened to two of the dams above. The likelihood of such an accident occurring at Marietta may not be very great, from the fact that the Ohio is generally high at the same time as the Muskingum, and it is only the floods from the Ohio which pond back the water over the banks in the lower portions of the two towns. Still the arrangement of the mill-races, particularly the one on the Marietta side, tends to weaken the bank at a very critical point. Some piling and riprap have been employed on that side to arrest the further erosion of the banks.

I merely call your attention to this matter to show the expediency of designing some safer arrangement for supplying the mills with water. The mill-race on the Harmar side leads directly from the head of the lock through a timber conduit 20 feet wide and 4 feet high. This conduit is covered and passes parallel with the land-wall of the lock and 13 feet distant from it, and it is possible that the early settling and destruction of that wall was expedited by leakage from the culvert. The mill-owners lease their water from the State. The two mills are important and valuable properties, worth not less than $45,000, having a capacity of over 300 barrels of flour daily. I believe, however, that it is possible to design a new lock which will not interfere in any way with the operations of the mills as now located, excepting possibly at times during the progress of the work. But as the Marietta mill, the one concerned in the new project, has a reserve of steam-power, for use in periods of high-water, no serious trouble with the owners need be apprehended, in case the government should conclude to construct the proposed work.

THE WORK PROPOSED.

For the special purpose of admitting boats into a harbor of refuge, locks of a smaller size than those proposed for the Ohio will probably answer the purpose. Nearly all the steamers on this part of the river are stern-wheelers, a style of boat somewhat narrower than side-wheel boats of the same tonnage. All the Pittsburgh towboats are stern-wheelers, and none of them are over 45 feet beam and 250 feet long. The boats in the Pittsburgh and Cincinnati packet trade, of which there are now five in one line, as well as all the other passenger-steamers from Pittsburgh, are stern-wheel boats. The widest steamers are those in the Wheeling and Cincinnati trade, one of which is said to be 55 feet wide. There is now being built at Wheeling, however, a side-wheel boat 65 feet wide (over all) and 275 feet long, for the Cincinnati trade from that city.

As I have proposed a new lock with chamber 400 feet long by 56 feet wide, the boat last mentioned would be the only one which could not enter it. Experience has demonstrated the superiority and economy of stern-wheel boats on the shallow waters of the Upper Ohio, so that to design a very large lock for this place simply to accommodate the very few exceptionally wide boats on the Upper Ohio would be neither wise nor economical. Besides, there will always remain ample room below the lock to shelter the few boats which may hereafter be constructed too wide for admission into a lock of the dimensions proposed.

The length of 400 feet seems advisable in order to enable towboats to be locked through in company with several of their barges. In case of a rush of the larger towboats with their fleets to the harbor, the large boats could enter first, take two barges with them, and pass into the pool, leaving the remainder of their fleet to be brought through in two or more detachments by some smaller boat, as is done constantly at the locks on the Monongahela River.

It will be seen by the accompanying maps that the river-wall of the proposed new lock passes across the part of the river-bed scoured out by the wash from the dam. The deepest point on the line of the new work is shown to be 17 feet below low-water. The bottom is composed of fine gravel and sand, or such material as is carried in suspension over the dam. The depth of this deposit to the rock is unknown, but I believe the scour sometimes extends to the depth of 23 to 25 feet below low-water surface. I made some soundings after a sudden flood which indicated a scour or change of depth of several feet in a few days, but up to the time I left Marietta it was impossible, owing to the violence of the current, to take accurate soundings. Our regular survey had been made before the flood, when the water below the dam was as calm as a pond, and with no appreciable current.

In case of necessity, I believe the scour can be arrested by pinning mattresses to the bottom and having them weighted with stone. There will be no doubt a tendency in

the river to undermine the cribs or piling which may be used to surround and protect the foundations of the lock, and it would probably be best as an additional precaution to support such works on the side next the current with large riprap stones, which are easily obtained at the quarries in the neighborhood.

If a coffer-dam is employed in constructing the lock, it would probably not be necessary to inclose the land side of the walls. But it may be remarked that the depth of the water is quite considerable through which to carry a coffer-dam.

Your preference, expressed orally to me, of plans for founding the lock-walls, and, in fact, the entire lock-chamber, on a bed of concrete, making that a "monolith" to rest on piles, is, I think, the best that can be proposed for such a situation. With that idea in view, I would respectfully propose for your consideration the following plan of operations:

First. That a double row of close piling be driven from the dam downwards, parallel with the proposed lock-chamber and thence to the shore below, the object being to prevent the escape of the inclosed material. That, after being driven, the space between the rows, which might be 10 feet apart, be excavated as nearly as possible to the extreme depth of the scour. The piles then to be driven deeper, if they will go any deeper, and sheet-piling to be used occasionally where its addition would add to the imperviousness of the structure. The rows of piles then to be strongly braced and tied together and filled with broken stone. The river-side to be protected by large blocks of stone. The piles finally to be cut off evenly near the surface of low-water.

For the portion of the chamber *above the dam* I would propose that it be inclosed with a tight coffer-dam in the usual manner.

The entire area inclosed then to be excavated to the required depth, or filled where too deep to the proper height, and the bearing piles at intervals of 4 feet to be driven throughout the chamber. These piles to be cut off about 7 feet below the surface of low-water, and two courses of flooring timbers framed, bolted, and floated over the desired position. Before sinking the floor I would suggest that it be first sided up to the height of 12 feet, somewhat in the manner of coal barges, so as to be water-tight, and that the floor be covered with tarpauling to prevent the concrete from seeping through it. After being gradually sunk with the concrete, which should be 3 feet deep over this floor, a few outside piles might be driven at intervals and bolted to the sides of the box in order to aid in supporting them against pressure, after which the chamber can be pumped out preparatory to laying the masonry.

While the outside piles or crib-work protection may not cost any less than a coffer-dam, this plan at least is free from the risks that would be attendant upon that method of construction in a place where a light sand and gravel bottom is subject to the erosion from the overfall of a dam now in existence. I witnessed the water pouring over this dam when it presented a breast of 9 feet deep and 530 feet long, and it created such a maelstrom below, that large trees would disappear in the depths and emerge at random a hundred feet or more farther down. It is easy to imagine that such materials, propelled with such force, may, even in the limited period of their submergence, plow up the bed of the river with great effect. I have said enough, however, to call your attention to the difficulties of the place, and suggest the above plan, which I think will meet them.

The exit below, from the proposed lock, passes straight down the Marietta side on an easy line to the bridge. Below the bridge, the removal of the piles, and a little dredging not exceeding 2,000 cubic yards, will continue the channel nearly straight to the Ohio River.

After the new lock is built it would be of advantage to entirely remove the old lock and extend the dam on that side to the shore, thus preserving almost the same length of dam as exists at present, and therefore not increasing the liability to "cut around," or overflow the bottoms, which dams, built to confine the natural width, always have. And further to prevent all possibility of a cut-around on the Marietta side, the land-wall of the new lock, in accordance with your suggestion, and as shown on the map, is extended upstream, and thence turned into the solid bank above the entrance to the mill-race. Through this wall culverts provided with valves can be set, which can be arranged to thoroughly regulate the flow of water to the mill. With this plan it would be safe to turn the mill-race directly down to the mill. But in case this is done I would suggest that the water-course be puddled to prevent leakage. The present course of the mill-race, which extends a square back into the city, and is thence, with two right-angle turns, brought to the mill, could be filled up, and an unsightly place in the neighborhood of Marietta's beautiful park be made more inviting. In addition, the park could be extended along by the lock to the mill.

The only objection to locating the lock as proposed arises from the fact that the Marietta and Zanesville packets have their landing at the foot of the street just above. But it should not be forgotten that during much of the year there will be little use for the proposed new lock, and that therefore they could land at that place as usual.

To complete the plan of forming a harbor of refuge at Marietta there remains only the matter of transforming the Marietta span of the Marietta and Cincinnati Railroad bridge into a draw-bridge. This span is 160 feet in the clear opening, so that a 30-foot circular pier in its center would leave for the opening on each side a width of 65 feet, or 9 feet more than is actually necessary to pass boats of the full width of the proposed lock. The change can be made without seriously incommoding the business of the railroad. The road terminates immediately upon crossing this bridge and reaching the main street of Marietta, one square distant from the bridge. The freight station and shop is located on the Harmar side. The bridge is also used as a highway for wagons and foot-passengers. The track of the Cincinnati road connects in Marietta with the Duck Creek Valley Railroad, which is the outlet for the north, but the transfer of freight between these roads is comparatively small.

Of course, if necessary, the change in the railroad-bridge can be effected without stopping its use at all. I have mentioned the facts of the case merely to give a correct understanding of the position of affairs.

The city of Marietta owns the ground which would be occupied by the lock and its appurtenances, and no doubt would invest the United States with a clear title to all the space required. I was informed also that the State of Ohio would enter into any arrangement which the United States Government might desire regarding privileges to navigators desirous of using the lower pool of the Muskingum River improvement as a harbor of refuge.

My estimate of the cost of the work on the plan proposed amounts to $205.000; which figures include, besides the cost of the new lock and changes to the old dam, the cost of converting the Marietta span of the railroad-bridge into a draw-bridge.

Respectfully submitted.

THOMAS P. ROBERTS,
Assistant Engineer.

Col. WM. E. MERRILL,
Corps of Engineers, U. S. A.

V 8.

EXAMINATION OF THE ALLEGHENY RIVER, UP TO THE MOUTH OF FRENCH CREEK.

UNITED STATES ENGINEER OFFICE,
Cincinnati, Ohio, December 19, 1878.

GENERAL: I have the honor herewith to submit the report and maps of the examination of "the Allegheny River up to the mouth of French Creek," ordered in the last appropriation act for rivers and harbors.

The lower 30 miles of this river, from Freeport at the mouth of the Kiskiminetas, to Pittsburgh, at the junction of the Allegheny and the Monongahela, was carefully surveyed in 1875, and the results are published in the Annual Report of the Chief of Engineers for 1876 (part 2, p. 147). As it was evidently unnecessary to repeat this work so soon, the present examination was limited to the part between French Creek and the mouth of the Kiskiminetas. The survey was intrusted to Mr. Thomas P. Roberts, assistant engineer.

Inasmuch as the allotment for this river was very small, and there was already on file in this office a complete map of the Allegheny River made in 1828, under the direction of Lieutenant-Colonel Kearney, Corps of Topographical Engineers, I directed Mr. Roberts to use that map as a basis and to carefully note all changes that had occurred during the past 50 years. He found that, while there was a general agreement with the map, and some changes that might have been expected, there were yet others that could not readily be explained. Should the systematic improvement of the Allegheny be undertaken it will be necessary to revise the line of levels, as our examination showed several apparent discrepancies. The proper method of inaugurating a system of locks and dams on the Allegheny would be to begin within the limits of the city of Pittsburgh, where there are strong local reasons for the con-

struction of at least one lock and dam. Until this dam is completed the work that can be advantageously done on the river above Pittsburgh is limited to the removal of obstructions of all kinds, and the improvement of very bad shoals so as to get all the water into one channel and to make them safer for vessels. The present estimate is limited to this kind of work. It is as follows:

7,500 feet of dams and dikes built of cribs filled with stones, at $5 per running foot	$37,500
Removal of rocks in channel:	
3,300 cubic yards, at $2.50	8,250
Removing dangerous rocks on shore	1,000
	46,750
Engineering and contingencies	4,675
Total	51,425

The style of construction of the dams and dikes is to be the same as that adopted on the Ohio at White's and the Trap, which has thus far proved to be the only successful system where such structures are exposed to heavy running ice.

Steamboat commerce on the Allegheny has almost been extinguished by railroad competition, by natural obstructions in the river, and by obstructions that man has put there in the shape of low bridges, with narrow spans badly located. There is hardly any river that shows more clearly the utter inadequacy of State laws to protect river commerce from wanton injury.

The laws of Pennsylvania on the subject of bridges may be models of legal wisdom, but their results, as seen in the structures built under their authorization, are disastrous. The United States has not interfered, and the Allegheny is merely one of a number of rivers on which cheap transportation has been injured or destroyed by sheer negligence.

Should the commerce of this river be revived, the reconstruction of some of the bridges will be a matter of vital necessity.

Respectfully submitted.

WM. E. MERRILL,
Major Engineers.

Brig. Gen. A. A. HUMPHREYS,
Chief of Engineers, U. S. A.

REPORT OF MR. THOMAS P. ROBERTS, ASSISTANT ENGINEER.

PITTSBURGH, PA., *December* 14, 1878.

COLONEL: I have the honor to present herewith my report upon the reconnaissance of the Allegheny River, between Franklin and Freeport, Pa., which work you assigned to me in August last.

My instructions were simply to bring the maps of the survey of 1828 up to date, to note important changes which have occurred in the river or its surroundings, and to obtain information concerning the commerce of the river, &c. Copies of the maps of the surveys of 1828 of the Allegheny River, made under the direction of Lieutenant-Colonel Kearney, Corps of Topographical Engineers, were given me. The tracings consisted of a map of the river, drawn to a scale of 2 inches to the mile, which indicated the islands and ripples and neighboring topography; but there were no soundings or channel lines shown, and the names of rapids, &c., excepting in a few instances, were omitted. Accompanying the map was a profile drawn to the same horizontal scale, viz, 2 inches to the mile, and 1 inch to 50 feet vertical. There being some confusion with the arrangement of the profile, you requested me as another duty to rectify it. There were also several sheets exhibiting cross-sections of the river at various points on a larger scale than the general map.

THE PROFILE OF THE ALLEGHENY RIVER.

I found the map to be generally correct for distances and shapes, and it proved a very material aid in the construction of the new maps which accompany this report, and which exhibit as clearly as the scale will permit the various changes in the shapes of the islands, ripples, and bars which have occurred in the half-century interval between the survey and the reconnaissance. But I had not proceeded very far below Franklin when I discovered a number of curious changes, or errors, probably, on the profile, and of such a nature that, without leveling the entire distance, it would be impossible to make a profile which would represent the river in its present condition. Fearing that the available funds would not be sufficient to do the work which a careful leveling of such a distance involved, and that the remarkably low water in the river would not continue for other useful examinations, I concluded to disregard the old profile, and in the case of each rapid to measure its length and descent, and report a table of them. I have, therefore, no record of the fall of the river between rapids.

Independently of the profile of 1828, the fall of the Allegheny River between Franklin and Pittsburgh can be determined from the surveys of Lieutenant Mahan in 1875, as far as Freeport, 30 miles, and for the residue of the distance from the surveys of the Allegheny Valley Railroad, which closely follows the river on the left bank all the way along.

I present herewith a table of fall of the Allegheny River, as shown by the authorities mentioned:

	Miles.	Surveys of Lieutenant Mahan.	Surveys of Allegheny Valley Railroad.	Surveys of 1828.	
		Feet.	*Feet.*	*Feet.*	
Pittsburgh and Freeport	30.0	52.14	48.46	39.00	Lieutenant Mahan connected with the Monongahela gauge, and the others, probably, with the Allegheny gauge.
Freeport to mouth of Mahoning	25.0	.....	52.50	48.00	
Mahoning to mouth of Red Bank	8.5	.....	24.20	23.00	
Red Bank to mouth of Clarion	20.6	.....	40.50	43.00	
Clarion to East Sandy Creek	33.4	.....	91.30	86.80	
East Sandy to French Creek	5.4	.....	15.90	13.00	
Totals	122.9	52.14	272.86	252.80	

Although, as stated above, I found various errors in the surveys of 1828, as shown by the profile, they appeared to be local. On the rapids we sometimes found more fall, at other times less, than it gave, but more frequently we found *less* fall. The principal difficulty was to reconcile distances and relative positions of rapids, their length, &c. We nearly always found the length of the rapids to be less than the old profile made them, but this fact would make no difference with their descent if the pools above and below were level planes. Until a regular system of slackwater improvement of the Allegheny River is undertaken it may not be worth while to investigate the discrepancies between the several statements. I can say of our own levels, that they are correct for the river at its lowest stages on the lengths given.

There being no field notes or report accompanying the old maps, I found it difficult to discover the positions where cross-sections had been taken. Some of them were across islands, but many of the islands had disappeared and all of them were more or less changed in shape, so that in some places I could not be sure that I was nearer than 500 feet of the old positions; notwithstanding, however, we made a number of sections as nearly as possible on the old lines, but for purposes of critical comparison they cannot be relied upon. I am satisfied, however, from the general result of these measurements of the width of the river, that it is now somewhat greater than it was 50 years ago. My attention was called to one place where the bank for nearly one-half a mile had been encroached upon by the river, upwards of 150 feet, and at many other places I was informed the banks had been washed away to a greater or less extent. The river has, as a general rule, an exceedingly contracted valley, flowing for the most part between hills protected at their bases by masses of rock which have fallen down their slopes, so that the increase in width referred to will never likely proceed so far as to change the *régime* of the stream. The clearing of forest lands, I believe, is followed by greater fluctuations in our rivers. I think the storm-waters undoubtedly reach the streams more rapidly now than formerly, and thus may be effected the increase in width of river-beds observed so frequently in the West. Settlers along the Allegheny have stated that these changes have mostly occurred since the oil discovery, which was followed for a number of years by great activity in steamboat navigation; the waves from the boats, it was averred, undermined the banks and sides of islands, causing them to cave in and be carried off with the swift current.

COMMERCE OF THE ALLEGHENY RIVER.

The Allegheny River as high up as Franklin, 123 miles above Pittsburgh, is navigable for a small class of steamers about 6 months in the year, but the periods of navigation are irregular and dependent upon freshets. The towboats which are usually employed in towing oil-flats draw generally about 2½ feet of water, and for that depth of navigation it is not safe to rely upon more than 4 months in the year, allowance being made for 2 months every winter when the river is frozen up. It is several years since there were any steamers engaged in the general freight and passenger business, the construction of the Allegheny Valley Railroad to the oil regions and through to Buffalo, N. Y., having effectually destroyed that interest. But notwithstanding the rivalry of the railroad and pipe lines, considerable quantities of oil are brought down to Pittsburgh from Brady's Bend, Parker's, and other points higher up, sufficient at least to indicate that were the river improved it would be more largely used for the transportation of this product. Besides the business in oil, the towboats frequently ascend with small fleets of Pittsburgh coal, which is recognized by the oil producers to be better fuel for their engines than any found along the Allegheny. There is also a large trade done in the transportation of barrels by these steamers.

After the river falls below a 2½-foot stage it is deserted by the steamers, and for the remainder of the time the business is transacted upon small flatboats pulled by horses. Quite a number of these boats are employed in transporting limestone from the quarries to the furnaces near Pittsburgh, while considerable quantities of building-stone are shipped on them, principally from near Freeport to Pittsburgh. There is, in addition, a considerable trade in bowlders for street-paving, fire-clay, railroad-ties, and a general assortment of country produce. There are also floating store or "junk boats," which move from place to place as business demands.

But the chief commodity of commerce on the Allegheny River is, doubtless, lumber. Immense quantities of lumber come down every spring in rafts from the headwaters, which are manned by the half and quarter breed Indians forming the remnant of the Cornplanter's tribe, whose home is in New York. The number of these rafts is augmented by others from the Clarion, Red Bank, Mahoning, and Kiskiminetas rivers. The bulk of the supply of pine lumber for Pittsburgh, Southwestern Pennsylvania, and large portions of West Virginia and Southern Ohio, comes from the Allegheny River.

Statistics of the trade and commerce of the Allegheny Valley can only be obtained by collating many records, which would require much patient labor and time. Eight counties in Western Pennsylvania and one county in New York abut directly upon its navigable section, while several other counties, situated upon its headwaters or on its larger tributaries, furnish lumber, staves, &c., to the main stream, and are thus quite directly interested in its navigation.

In 1876 there were 34 steam saw-mills and 38 planing-mills, sash and box factories in Pittsburgh, which annually consumed 107,000,000 feet of lumber, mostly pine and hemlock. Of the quantity and value of the lumber which passes Pittsburgh I could obtain no record, but from what information I could obtain, the lumber trade of the Allegheny River in pine and hard woods aggregates over 100,000,000 feet, board measure, annually. A report made by the State board of Centennial managers states: "Although a large part of the Allegheny Valley has been almost denuded of its pine forests, and some portions of the Susquehanna lumber region have shared a similar fate, it may be said that the State is heavily timbered, and that many years must elapse before its forests will disappear."

Mr. Samuel P. Johnson, in his sketch of Warren County, Pennsylvania, concludes that since 1840 the Allegheny lumber trade has declined, though still very important. He does not give its present volume. He refers, however, to the immense development of late years of the tannery industry, which uses the hemlock bark of Western Pennsylvania. He mentions, also, that in 1873 there was still standing in the Allegheny region 1,000,000,000 feet of white pine.

In 1876 five coal-works along the Allegheny River reported 550 men employed, and the annual output of coal at 9,053,280 bushels, or about 350,000 tons. This was all shipped, mostly to the oil regions, by the Allegheny Valley Railroad. No record is given of the coal mined and shipped by river. There are large coal-fields along the river opposite the side occupied by the railroad, which could be worked to advantage if the navigation of the river was improved.

The yield of petroleum is now regularly nearly 40,000 barrels daily. But so great are the uncertainties of the river in its present condition that but little, comparatively, of this product is shipped upon it. I was informed, however, that in 1877 263,000 barrels of oil were shipped in bulk-boats from the Allegheny River to Huntington, W. Va., on the Ohio, for transportation to the seaboard via the Chesapeake and Ohio Railroad, and that this method of shipment, roundabout as it may appear, continues to grow in favor. This fact appears to demonstrate the superior advantages river transportation possesses over railroad, at least for this commodity. Oil wells in countless numbers are in operation in the Allegheny Valley, while pipe lines are to be seen

suspended across the river or laid upon its bed, all leading to the "pumping stations" on the railroad. The oil industry is the second in importance in the State of Pennsylvania, and stands third or fourth in rank in the list of our national exports, yet nothing has ever been done to improve the navigation of the fine river which bisects the region of its production for over 100 miles. I have been reliably assured that it would be of great benefit to this trade to have longer-continued seasons of navigation on the Allegheny. The improvement of less than 70 miles of river would put the lowermost pumping station in connection with the vast inland system of cheap transportation, which, extending from Pittsburgh via the Ohio, reaches every point on the Mississippi River and its branches. The progress of the radical improvement of the Ohio River would undoubtedly receive additional impulse through the demands of commerce which this improvement of its headwaters would give it.

THE IMPROVEMENT OF THE ALLEGHENY RIVER.

It has been proposed to construct locks and dams as high up the river as the mouth of the Kiskiminetas, 30 miles above Pittsburgh, and such works would become a necessity in case of the construction of a trans-Allegheny Mountain canal on the Kiskiminetas route to the seaboard. Above that point there is not trade enough at present, I believe, to warrant the extension of such a costly system of improvement, though possibly the demands of the oil trade and the development of the mineral resources of the country may some time in the future require it. A reservation might with propriety be made also in the case of the river as high up as Red Bank Creek, which stream is spoken of for a trans-Allegheny canal. But aside from such projects, the claims of the Allegheny are entitled to special and independent treatment.

The Allegheny is the main fork of the Ohio, and possessing at low-water every considerable volume in much narrower dimensions than the latter, it would appear to be susceptible of a more easy low-water improvement. I observed that whenever the stream was united in one body, even in the swiftest rapids, there was a depth of at least 1 foot, and that the width of such places was seldom less than 200 feet. The number of places where the depth at low-water was less than this were not numerous, and their character was such as to indicate that by means of low wing-dams, the removal of rocks, &c., a safe channel of that depth could be made through them. The present difficulty with the navigation of the Allegheny is that from the number of rocks in its rapids it is *unsafe* for steamers to load to the full channel depth. In this respect the Allegheny differs from the majority of Western rivers, where the boats can run at least safely, though frequently rubbing the bottom. Therefore, if by minor improvements such as have been suggested a safe channel of even 1 foot can be secured on the Allegheny, it will at once add materially to the length of time it can be navigated.

The table annexed gives the number of days at Oil City and at Pittsburgh in each month of the present year at which the river was at or below certain stages of depth. Oil City is 9 miles above Franklin, or the mouth of French Creek, where our reconnaissance began:

	Pittsburgh.				Oil City.			
	Number of days 1 foot depth or less.	Number of days between 1 and 2 feet depth.	Number of days between 2 and 3 feet depth.	Number of days over 3 feet depth.	Number of days 1 foot depth or less.	Number of days between 1 and 2 feet depth.	Number of days between 2 and 3 feet depth.	Number of days over 3 feet depth.
1878.								
January	0	0	10	21	11	1	3	16
February	0	0	0	28	0	17	5	6
March	0	0	0	31	0	6	2	23
April	0	0	0	30	22	2	0	6
May	0	0	0	31	8	7	4	12
June	0	0	0	30	5	12	6	7
July	0	7	18	6	22	6	3	0
August	4	8	9	10	20	9	1	1
September	13	7	4	6	18	6	2	4
October	24	1	0	6	25	4	2	0
November	0	0	0	30	0	13	4	13
December	0	0	0	31	0	0	0	31
Total	41	23	41	260	131	83	32	119