REPORT

TO THE

BOARD OF DIRECTORS,

OF THE

SANDY & BEAVER CANAL,

BY

W. MILNOR ROBERTS,

ENGINEER.

Read on the 31st of January, 1846.

JOSEPH WILKINSON, PRINTER,

NEW LISBON, OHIO.

1846.

OFFICE OF THE SANDY AND BEAVER CANAL COMPANY, JANUARY 13th 1846.

W. MILNOR ROBERTS, Esq., Chief Engineer:—

Sir—

The Board of Directors have thought that it would be satisfactory to the Stockholders to have a Report of the condition of the line prepared for publication and distribution; and, to carry out that view have directed me to ask you for a general Report, to be furnished at as early a day as your other engagements will permit.

As the work on the Canal had been suspended for a number of years, it would be desirable that you would state the condition in which you found it previous to the re-commencement in August last; the amount and character of the work done under your supervision up to the date of your last current estimate; and the estimated cost of completing and making navigable the whole line from the re-commencement. And as portions of the line are expected to be ready for navigation before the heavy work on the summit can be completed, you will please state the time, as also at what time the whole line may be finished.

The unusual and long continued drought of last summer having caused a corresponding diminution of the usual flow of water on the summit for a long period, has enabled you to arrive at conclusions with regard to the supply on the summit, commensurate with an extensive trade, which would be satisfactory to have embodied in your Report; together with other information that may occur to you, interesting to the Company.

With much respect,

DAVID BEGGES,
PRESIDENT.

At a meeting of the Directors of the Sandy and Beaver Canal Company, held in their office in New Lisbon, on the 31st of January, 1846, W. Milnor Roberts, Esq., Chief Engineer, presented a report, made in compliance with the order of the Board of the 13th of January, which was read and accepted; and on motion,

Resolved, That the Secretary be requested to cause a sufficient number of copies of the Report to be printed in pamphlet form, and distributed to the Stockholders.

REPORT.

TO THE PRESIDENT AND DIRECTORS OF THE SANDY AND BEAVER CANAL COMPANY.

GENTLEMEN—In compliance with the request of the Board, contained in a letter of the President, dated January 13, 1846, I have the honor to present the following Report upon the Sandy and Beaver Canal:

A considerable period having elapsed since any detailed account of the line has been submitted to the Company, and as it is desirable that the actual condition of the work should be understood by all who feel interested in its progress, I may be pardoned for recapitulating, to some extent, information contained in former reports. A history of the difficulties which led to the suspension of operations in 1837 and 1840, of the exertions made to effect a resumption, and of the eventual success of the effort, although it might be interesting to many, is not deemed necessary in this communication; I proceed therefore at once to the Report:

DESCRIPTION OF THE LINE.

The Canal is seventy-three and a half miles in length, connecting the Ohio river at the mouth of Little Beaver, forty miles below Pittsburgh, with the Ohio Canal, at Bolivar, eighty miles south of Cleveland.

For convenient superintendence, it has been separated into three Divisions.

The Eastern Division, twenty-seven miles in length, extends from the river to a point two miles west of New Lisbon; and includes the entire eastern slope of the Canal, of which upwards of seventeen miles are slackwater navigation. On this Division there are twenty Dams, and fifty-seven Locks, which overcome a rise of 464 feet. Dam No. 20, near the mouth of Little Beaver, will raise the water about 23 feet. The remaining Dams vary in height from 5 to 18 feet, and in length, from 150 to 230 feet. The lifts of the Locks vary in height from 5 to 13½ feet.

The Middle Division, or summit level, is 14½ miles long—comprising two Tunnels; one of which is 1060 yards and the other 300 yards in length. It also includes the Deep Cut at Hanover. The Reservoirs at Cold Run and West Fork are

also located on this Division, at points about four to five miles from the eastern end of the summit.

The Western Division, extending from the summit to the junction with the Ohio Canal, is 32 miles long, and embraces about five miles of slackwater navigation, 9 Dams, and 33 Locks, overcoming an elevation of 205 feet.

Making the number of Dams on the whole line 29; the number of Locks 90; and the total lockage 669 feet.

The valley of Little Beaver is peculiarly favorable for the slackwater navigation which has been so generally adopted on this part of the line; being narrow, with tolerably abrupt banks, and presenting secure sites for the Locks and Dams; and notwithstanding the large proportion of slackwater on this Division, a comparatively small amount of arable land will be overflowed.

The Middle Division is located upon ground of a different character, most of which, owing to the retentive nature of the soil, and peculiar shape of the country, is admirably adapted to its intended purpose.

The Western Division passes through the valley of the Sandy, a stream of an uncommonly permanent character, flowing with a gradual declivity of about 6 feet per mile, towards the Tuscarawas river. This valley is essentially different from that of the Little Beaver. It is wide and nearly level; and contains a rich and fertile soil, with its adjacent hills abounding in coal, iron, and sandstone of a superior quality. The excavations and enbankments consist almost entirely of alluvial soil, easily removed. Indeed, I have never noticed elsewhere, a section of country of the same extent (32 miles) offering so many facilities for the cheap construction of a Canal.

The whole line, from the Ohio river to the Ohio canal, abounds with good stone; and all the materials required in the construction of a Canal are convenient and cheap.

STATE OF THE WORK UP TO 1840.

The work on this Canal was first commenced in the spring of 1835, under the direction of E. H. Gill, Esq., as Chief Engineer, and was about two-thirds finished in 1837; when, in consequence of the general prostration of monetary affairs throughout the country, it was suspended. I take the following extracts from a Report made by Mr. Gill, August 7th, 1837, in order to show the state of the line at that period:

"The excavation of Canal and formation of towing paths along the pools from New Lisbon to the Ohio river (25 miles) arenow completed with the exception of portions of a few sections, not exceeding in all two miles in extent. On the same Division, the masonry of 19 Locks is completed, and of several more nearly so. Four Dams are finished, and four others require but the plank and ice-guards to render them complete.

"The entire amount of Lock and Dam masonry now constructed on the Division exceeds 31000 perches, in addition to which, eleven thousand perches of stone partly cut, and two hundred and fifty-three thousand feet of plank are prepared and delivered for the construction of Locks and Dams."

"The Summit or Middle Division is in a state of forwardness; twelve sections or five and a half miles of it are finished; five hundred and forty seven thousand six hundred and eighty cubic yards of earth have been removed from the Western Deep Cut —there still remain to be taken out 150,000 cubic yards of earth."

"Four thousand four hundred cubic yards of rock have been removed from the drifts of the Tunnel, and about five hundred feet in extent are now completed."

"The Reservoir mound on Cold Run is completed excepting a small opening left for the water to pass through till the land intended to be inundated shall have been cleared. The West Fork Reservoir mound is two thirds done."

"According to its present plan it will flood 500 acres of land, and contain upwards of 200,000,000 cubic feet of water.—Nearly all the ground occupied by the Reservoir has been cleared, the conduit pipes and stop cocks are prepared, and nothing remains but the completion of the mound to render it fit for use."

"On the Western Division, about twelve miles of Canal, three Locks, and one Dam, are completed. The entire amount of lock and Dam masonry constructed on the Division is 3924 perches."

"The heavy sections bordering on the Sandy creek from William's mill to Bolivar [about 3 miles] are with one exception either completed, or nearly so."

I have no doubt these extracts show concisely, the actual state of the work in the summer of 1837. In 1839, the Canal sustained some injury from a flood. As this is more particularly referred to in a Report made by Edward Miller, Esq., to

the Stockholders in Philadelphia on the 1st of July of that year, I take the liberty of making the annexed extract:

"A few days before I reached the Canal, an unusual fall of rain caused a violent flood in the waters upon both sides of the Summit, and much damage was done to the Canal in consequence. At four of the Dams the water rose above the guard banks, and caused breaches of considerable magnitude. The Canal and towing paths were also flooded for several miles, and one of the guard locks and two Dam abutments were severely tried. None of the masonry however was injured except one Dam abutment, which was undermined to such an extent as to require renewal. I have advised that the Dam in this case should be extended across the breach and the abutment, removed to the fast land. The obvious remedy against such evils in future, is to raise the guard Locks and abutments to such height as this disaster has indicated to be necessary. The Canal banks should also be raised and strengthened by strong slope walls in exposed situations. With reference to this I may remark that if the Reservoir mounds had been completed, much of the flood (which was highest on the West Fork of Little Beaver) *would have been* arrested; and probably no such accident would have occurred."

"I beg leave also, to take another short paragraph from the Report of Mr. Miller:

"The character of the work done upon the line has given me much satisfaction. The general plan appears to be good, and the masonry of the Locks and Dam abutments excellent.—I have taken the liberty, however, of suggesting to the President some alterations in the Locks yet to be constructed, which will in my opinion diminish their cost, without impairing their efficiency. The Dams have without exception stood well."

In this commendation of the character of the work done under the direction of Mr. Gill, I fully concur, and would add, that the repairs and other work afterwards completed under the superintendence of Roger Morledge, Engineer, seem to have been judiciously planned and faithfully executed. In 1839 and 1840 a considerable amount of work was done, principally along the Eastern Division. After the year 1840, as I have been informed, no work of consequence was done on the line except occasional repairs deemed necessary by the board for the security of the Locks and Dams.

CONDITION OF THE WORK IN JULY 1845.

The condition of the work in July 1845, was as follows, viz:

On the Eastern Division, the Canal and Towing paths along the pools were nearly finished, with the exception of about one mile immediately above New Lisbon; parts of sections Nos. 27 and 28 near the mouth of the West Fork, which had been greatly injured by floods; about one mile of Towing path and Canal near the Ohio river; and a number of short, detatched parts of sections, at different points.

The Lock work done, was equivalent to about thirty-two finished Locks. Twelve Dams (and the accompanying Guard Locks, included above) had been completed; and Dam No. 3 nearly finished. But at Dams No. 10, 17, and 18, the freshets had washed away portions of the guard banks and worn new channels for the stream around one end of each Dam; requiring extensions to be constructed across the breaches, and the removal and rebuilding of three abutments.

The remaining nine Dams were generally in good condition. At No. 12, a hole from 10 to 12 feet in depth had been excavated by the water just below the Dam, rendering it necessary to put in a crib filled with stone, and some additional gravelling and stone filling, to insure its future security. Dam No. 3, although still in an unfinished state, within about two feet of its intended height, and without the plank covering, had sustained no material damage. The Locks and embankments repaired in 1839 and 1840, had stood well. With a few unimportant exceptions, the timber and plank delivered along the Division, and in some cases framed, were found to be decayed and useless. The stone delivered for the Locks and Dam abutments, with the exception of a very small quantity, was of good quality, and available for present purposes. There was also some iron work, connected with Lock gates, on hand, which, with a little labor could be rendered fit for the use.

On the Middle Division, the work consisted almost entirely of excavations and embankments, which had suffered little injury, except in the Deep Cut at Hanover, where about 45,000 cubic yards, of earth and gravel had been washed into the Canal; and at the Big Tunnel, where a considerable quantity of loose stone and earth had been carried in by rains and partially closed the eastern entrance, and both working shafts. The excavated portions of the Tunnels, comprising in the aggregate, about

500 feet in length, were also filled with water. The drifting at the Little Tunnel, had not been commenced, although a large amount of earth, coal, slate and rock, had been removed from the cuts. The Reservoirs at the West Fork and Cold Run, remained very nearly as described in Mr. Gill's Report.

On the Western Division, a large portion of the excavation and embankment between the west end of the summit and the town of Minerva, a distance of about 7½ miles, had been finished; and the water power Canal, at the western end of the line (3 miles long) was far advanced towards completion. There yet remained to be completed, one section of about a half a mile in length, and the trimming up of several others partly finished, to finish these 3 miles. There was also a considerable amount of excavation and embankment at numerous intermediate points along the Division—the whole of this kind of work on this Division, being equal to about 12 miles finished. One Dam was finished, and in good order, and Lock work equal to five finished Locks, had been done. None of the work on this Division had sustained material damage, except the timber and plank formerly delivered for the mechanical jobs.

On the whole line, no portion of the masonry appears to have deteriorated from the effects of time. The hydraulic cement used in its construction, must have been of an excellent quality.

WORK TO BE DONE AT THE TIME OF RESUMING OPERATIONS.

Upon the resumption then, of operations in August and September last, the bulk of the work required to complete the Canal may be briefly stated, thus:

ON THE EASTERN DIVISION.

Excavation and embankment equal to three miles of Canal. Lock work, equal to the construction of 25 Locks. Work at Dams, equivalent to the erection of ten Dams.

The Dams on this Division, vary in length from 150 to 230 feet; and in height from 6 to 18 feet. No. 20, near the mouth of Little Beaver is 26 feet high, and raises the water about 23 feet. The Locks vary in their lifts from 5 to 13½ feet.

ON THE MIDDLE DIVISION:

Excavations and embankment equal to about nine miles of Canal, (about 3 miles of which contain a considerable portion of slate and rock,) including two hundred thousand cubic yards of earth and gravel to be removed from the Deep Cut at Hanover, and the cuts of both Tunnels.

At the Big Tunnel, rock excavation in the Tunnel, to the amount of 25,100 cubic yards; and the removal of the loose stone, gravel, and water, washed into the shafts and body of the Tunnel.

At the Little Tunnel nearly 11,000 cubic yards of slate, coal, and rock excavation, and 2,400 perches of masonry.

To complete the West Fork Reservoir, 50,000 cubic yards of embankment.

ON THE WESTERN DIVISION.

Excavation and embankment, (nearly all of a very easy character,) equal to 20 miles of Canal.

Work at Dams, equal to the erection of eight Dams. Lock work, equivalent to the construction of 28 Locks.

One Aqueduct across the Tuscarawas river, 400 feet long and 28 feet high.

The Dams on this Division, vary in length from 100 to 280 feet, and in height, from 5 to 12 feet. The Locks vary in their lifts from 5 to 10½ feet.

The number of Bridges required along this line is unusually small, compared with any other Canal with which I am familiar.

At the time of my first visit and examination of the Canal in June last, an estimate was furnished of the probable cost of completing it, based partly on personal observations, and in part, so far as *quantities* of materials, &c. were concerned, upon former Reports and documents in the possession of the Board. A change in the plan of constructing the Locks and Dams, was then contemplated (since carried into effect) reducing materially the cost of the work. Such prices were then assumed for doing the work, as experience, the general character of the route, and the aspect of the times, indicated as reasonable. A few of the Contracts, however, were still retained by the original Contractors, and were estimated at the old prices. Afterwards, about the time of receiving preposals, in August and September, compromises were entered into between the Com-

pany and several more of the old Contractors, under which they were permitted to proceed at prices somewhat above those I had assumed. Locks Nos. 21, 22 and 30, Dams Nos. 6 and 19, and section No. 4 on the Eastern Division; and Locks Nos. 13 and 28, on the Western Division, were arranged in this manner. Notwithstanding these changes, the Company have succeeded in letting the work upon such terms as to bring the present estimated cost below the amount of my original estimate.

On the 9th of August, nearly all the work between New Lisbon and the Ohio river, (25 miles,) the Tunnel and Cuts attached thereto, together with the Deep Cut at Hanover, were let out. On the 5th of September, nearly all the work from Waynesburgh to the Ohio C nal, (14½ miles.) was let. The work was contracted for upon terms favorable to the Company, and taken by responsible and experienced men, most of whom commenced operations forthwith, and have since prosecuted their labors with a degree of energy and judgment highly commendable. In December last, a contract was entered into with a responsible firm, for the completion of all the work not previously contracted for, between New Lisbon and Waynesburgh, upon which also operations have recently been commenced. So that all the work of consequence on the whole line, is now under contract and in the hands of experienced and efficient Contractors. I have, therefore, been enabled to prepare an estimate of the cost of finishing the Canal, without reference to any former estimates, and according to the contract prices, which is herewith submitted:

ESTIMATE.

Of the cost of completing the Sandy and Beaver Canal, ready for navigation, from the period of resuming operations in August 1845.

Excavation and embankment of sections,	$129,424,00
Construction of Locks, &c.,	195,225,00
Construction of Dams, &c.,	72,201,00
Deep Cut at Hanover,	50,920,00
Big Tunnel and cut at east end,	66,723,00
Little Tunnel and cuts at both ends,	42,775,00
Detatched jobs, new gates, repairs, &c., not included in other contracts, all on the Eastern Division,	23,510,00

Guard gates, on Western Division,	2,400,00
Reservoir mound at Cold Run,	700,00
Reservoir mound at West Fork,	9,100,00
Aqueduct and embankment,	6,000,00
Waste wears, bridges and Culverts,	15,210,00
Iron work and hauling not included in other contracts,	11,500,00
Cement and hauling,	6,795,00
	632,483,00
Add for Engineering and contingencies 10 per ct.	63,248,00
Total estimated cost,	$695,731,00

On the several Divisions, the estimate is as follows:

Eastern Division,	$192,605,00
Middle Division,	218,540,00
Western Division,	221,338,00
	$632,483,00

RELATIVE TO WORK DONE IN 1845.

The amount of work done upon contracts, up to the close of 1845, as per my estimates returned January 6th, 1846, was:—$80,059,00, exclusive of Engineering, and incidental and contingent expenses. The principal items of work accomplished since the resumption, up to the close of last year, may be enumerated as follows, viz:

The foundations have been prepared and laid at 16 Locks, the masonry of 5 Locks entirely finished, and 11 others, from one-third to three-fourths finished.

Nearly all the new materials required for the Locks on the Eastern Division from New Lisbon to the river; and on the Western Division from Waynesburgh to the Ohio Canal, are delivered. The new abutments at three Dams, have been finished, and Dams Nos. 5 and 6 raised entirely across the stream, to the height of about six feet. Nearly all the timber for the Dams, with the exception of Nos. 19 and 20, has been prepared and left at safe and convenient points. The timber and plank for Dams Nos. 19 and 20 (the two largest Dams) have been contracted for up the Allegheny river, and will doubtless be delivered at the time of the spring freshet. The Deep Cuts

at the Tunnels, and at Hanover, have progressed vigorously. On the 1st of January, at the time of the last current estimate, 52,000 cubic yards had been removed from the Hanover cut; 33,000 cubic yards, (principally slate,) from the cuts at the Little Tunnel; and 15450 cubic yards (principally rock) from the Deep Cut at the Big Tunnel.

The slate rock near the entrance of the Little Tunnel, proves to be much more compact than was at first anticipated, and it is quite probable that a portion of the Tunnel may be firm enough to dispense with artificial arching; but in my estimate of the cost, the expense of arching throughout, has been included.—The Contractors expect to commence drifting at both ends of the Little Tunnel, within a few weeks.

At the Big Tunnel, the Contractors have encountered considerable difficulty in removing the loose material and water from the shafts, and the Eastern entrance. Part of the difficulty is attributable to their delay in obtaining the steam engines and necessary fixtures, whereby much of the fine weather of last fall was lost, and their labors retarded by the severe weather which occurred in December. Early in January, an arrangement was made dividing the work into two separate contracts, which will doubtless, prove advantageous to all parties, and facilitate its completion. On the 14th of January they commenced tunneling at the eastern end, and have since advanced the drifting at the rate of three feet per day. In a very short time the Contractors will be working at five different points on the Tunnel. The excavation is through a greyish, homogeneous sandstone rock, of the very best kind for Tunnel purposes; being sufficiently solid and durable to dispense with artificial arching, and yet easily drilled and blasted. It is decisively of a more favorable nature, in every respect, than the material of four different Tunnels, of the character of which I had the best opportunities of judging. I allude to those on the Union Canal, the Western Division of the Pennsylvania Canal, the Harrisburgh and Lancaster and the Allegheny Portage Rail Roads, in Pennsylvania.

The excavation of the Little Tunnel, will consist partly of rock and partly of a compact state and of a vein of coal about twenty inches thick, which appears at both ends at the same height, or level, about ten feet above Canal bottom. This vein occurs at a very advantageous elevation, just at the springing line of the arch, and will greatly facilitate the operations of

mining and shaping the Tunnel. The coal, itself, is also of an excellent quality, and is now used for the steam engines employed in removing the material from the Big Tunnel shafts.

TIME OF COMPLETING WORK, &c.

The contracts between New Lisbon and the river, and between Waynesburgh and the Ohio Canal, stipulate for their completion by the first of September next; and from the amount of work already done, and the persevering energy of the Contractors, my opinion is, that these portions of the Canal will be ready for navigation at the period named.

The time fixed for completing the remaining parts of the line, is April 1st 1847. Much the largest portion can readily be finished with ordinary exertions during the present year. But the period for the opening of the Western end of the Summit, will, in all probability be regulated by the completion of the Tunnel; or rather of that portion of the Tunnel lying between the two shafts, in which there yet remain to be excavated, about 217 yards in length from each shaft. At the rate of progression recently effected at the eastern end, viz: three feet per day, it would require 217 days. But allowing one half or half a yard per day to be accomplished, the whole Tunnel would be finished early in April 1847. We may, therefore, reasonably anticipate the opening of the entire Canal in April 1847.

It is not my desire to excite expectations not founded on substantial grounds, in regard either to the cost, the time of completion, or the ultimate success of your improvement. So far as concerns the two first named considerations, it has been my endeavor to place them fairly before the Company. Some views in regard to the last, will be found towards the close of my Report; but before introducing them, I would respectfully offer some remarks on the subject of the supply of water; and I may here take occasion to repeat what is stated in my Report of June last, viz: "That I had long entertained erroneous views in regard to it—had heretofore doubted the sufficiency of the supply, but that this doubt had now vanished."

Previous to my first visit to this line, the only opinion—or rather impression (for I had scarcely formed an opinion) entertained on this subject was founded on rumor, never having been called upon to make any examination of the question. I

recollect distinctly, having formed a similar opinion, or impression, with respect to the supply of water on the Erie Extension Canal, which, as in this case, upon an examination of the subject, was at once discarded as erroneous.

SUPPLY OF WATER.

The Reports of the Engineers who have preceded me in the examination of this question, concur in these general facts:

1st. That the natural flow of the streams will keep up the Canal (except lockage) on the entire Eastern Division, from Dale furnance to the river; and on the Western Division from the mouth of Davis' branch of the Sandy to the Ohio Canal; leaving three miles of the Western Division, and fourteen and a half miles of summit to be supplied, in part, by Reservoirs.

2d. That the Summit (except four miles along the valley of West Fork) is located in the most depressed ground, through a remarkably retentive soil, and is so arranged as to receive the drainage of a large scope of country; that the excavations expose a consideaable number of permanent springs, and that as the work proceeds, the quantity of water from these constantly increases; from which it has been fairly inferred, that there will be little or no loss from leakage on ten and a half miles.

3d. That the summit level and the Reservoirs which can be emptied into it, receive the drainage of 80 square miles, and that the Reservoirs may readily be filled every season before the commencement of dry weather.

I am convinced, from my own observations, that these premises are correct; and that in the former reports and calculations, they have been stated without the slightest exaggeration. There is a co-incidence of opinion, founded on experience and carefully digested data and calculations, proving that the sources of supply, for all the water requisite for the passage of an immense trade, are abundant.

The reservoirs on the summit, the West Fork, and Cold Run, as at present arranged, will contain 306,500,000 cubic feet of surplus water, *all* of which is available for the purposes of navigation, in addition to the minimum flow from streams and springs.

In order to put the matter to a severe test, I am certainly under any former calculation in assuming, as possible, the following positions:—

1st. That the reservoirs may only be filled during the winter and spring—once per annum.

2d. That the natural flow of the streams to the summit, and on three miles of the Western Division, from the last of May to the first of October, should cease entirely.

3d. That no rain, whatever, should fall during this period of one hundred and twenty-two days, and that one-sixth of the daily supply from the reservoir should be lost by evaporation.

4th. That four miles of the summit level may require 100 cubic feet, ten and a half miles may require 25 cubic feet, and three miles on the Western Division may require fifty cubic feet, per mile, per minute, for lockage and leakage alone; and that the leakage of the Locks at the ends of the Summit may be 200 cubic feet per minute,

5th. That the passage of each boat across the summit may require an expenditure of 19,500 cubic feet of water.

6th. That no greater proportion of business should be done on the Canal during the spring and fall than through the duller season of summer.

This I consider a union of unfavorable circumstances, sufficient to test the capability of the present arrangements for supplying the canal with water. From these data the following result is deduced—

CALCULATION FOR 122 DAYS:

Daily supply from reservoirs,		2,511,967 cubic feet.
Daily loss from evaporation		418,661
do.	do. on four miles of summit	576,000
do.	do. on 10½ " of do.	378,000
do.	do. on 3 miles of Western Division	216,000
do.	do. from leakage of Locks at ends of summit	280,000
		1,876,661
Leaving for daily lockage water		635,306 cubic feet.

[F] Assumed quantity required for the passage of a boat 19,500 cubic feet—sufficient for thirty-two boats per day.

Assuming the boating season to continue from March 20th to December 5th, or for 260 days; and that boats should carry

upon an average only 30 tons each, this would pass a trade of two hundred and forty-nine thousand six hundred tons.

But the heavieat portion of the trade will probably be carried during the spring and fall, when the streams are flush, and the supply of water ample for an amount of trade correspondent to the full capacity of the Canal. Whereas the foregoing calculation carries the minimum capability, upon the data assumed, and under the adverse terms enumerated, throughout the entire boating season.

Upon examination, it will be observed that I have not included the minimum flow from the streams in dry weather, as established from careful measurements made by Messrs. Gill & Hage in the unusually dry fall of 1834, viz:—558 cubic feet per minute, or 803,520 cubic feet per day; and I have kept out of view the reservoirs at Davis's branch and Mendenhall's Run, which, together, will contain 141,000,000 cubic feet.

A number of sites for other reservoirs present themselves; and if, hereafter, the business on the Canal should prove to be one million of tons per annum, it will only be necessary to arrest the drainage of the remaining country at command. But 24 square miles are drained into the reservoirs of Cold run and West Fork, leaving the drainage of 56 square miles to be stored up hereafter, should a great augmentation of trade demand it. The reservoirs at Cold Run and West Fork are all that I deem necessary at present.

The result of Mr. Miller's calculations, as contained in the report before referred to, shows that, with the present arrangements at Cold Run and West Fork, there would be a trade of 335,000 tons—allowing 250 days for boating, and each boat to carry but 25 tons. With the drainage of 34 square miles of country, according to his calculations, there would be water enough to pass 900,000 tons per annum. But even 250,000 tons perannum, at only one cent per ton per mile, would yield an income of $183,700.

I am fully satisfied that, with the two reservoirs as now arranged, there will be an abundant supply of water for a heavy trade, and that the other reservoirs at the command of the Company, will furnish water enough for more than a million of tons per annum. I think any one who will examine this subject fairly, will reach a conclusion not less favorable.

It should be borne in mind, that all the sources of loss are fully provided for in the foregoing calculation, and that every cubic foot additional is applicable to lockage.

PROSPECTS OF TRADE, &c.

The region of country through which the Canal passes, abounds in the staple and most profitable articles of Canal transportation—wheat, iron, and coal; and possesses unusual facilities for manufacturing on an extensive scale.

Immense quantities of grain are raised in the valleys of the Sandy and its tributaries, for which *Massillon* and *Akron* have hitherto been the principal receiving depôts, nearly all of which, upon the completion of your Canal, will naturally find a market at much nearer and more convenient points along this line.

Some idea may be formed of the grain transportation through this part of Ohio, from the fact, that at Massillon alone, there have been received in a single year, *from the original producers*, upwards of a million of bushels.

The *position* of this line also entitles it to the highest consideration; constituting as it will, the shortest and most direct connecting link between the great state improvements of Ohio and Pennsylvania—forming in fact, a continuation of the system, commencing at Philadlphia and stretching to the great west. Beginning at the Ohio river, near the line between the States of Ohio and Pennsylvania, at a point equi-distant from Wheeling and Pittsburgh, and terminating on the Ohio Canal 80 miles south of Cleveland.

For every ton of produce coming from Bolivar, or any point South thereof, and for more than 30 miles north, on the Ohio Canal, destined eastward, this route has undeniable advantages over any other; and it may safely be presumed, that all the merchandize and manufactures sent from Philadelphia, Baltimore and Pittsburgh, intended for the flourishing and populous counties of Columbiana, Stark, Carroll, Wayne, Tuscarawas and Holmes immediately on the line of this, and the Ohio Canal; and a large proportion of that destined for the counties of Richland, Knox, Coshocton, Licking, Perry, Franklin, Fairfield and Pickaway, must seek this, as the cheapest channel. *

The merchants in these counties, may purchase their goods in Philadelphia, and have them for sale on their shelves, before the Erie Canal through New York, and the harbor at Buffalo, are open in the spring. This is a consideration of very great

* The population of these fourteen counties is half a million.

importance, and must have its weight in directing business men from this region of country to Philadelphia as their best market.

The munificent bonus of the State of Ohio, by which your Company is entitled to receive the gross tolls accruing on the Ohio Canal on all such articles and passengers as may be carried twenty miles or more on this line, will in itself afford a handsome income. The profit to be derived from this source, during seven years after the completion of the Canal, has been variously estimated at from a half a million to one million of dollars. It will be the means of opening a large coal trade between the Sandy Valley and the Lakes, and will enable the Company to adopt such rates of toll as will attract an immense business.

Considerable revenue will probably be received from the sale or lease of water privileges and lands along the line. The Company own a number of eligible water powers, the most important of which is at Bolivar, at the junction with the Ohio Canal. Here for three miles, the Canal has been enlarged to 60 feet width and five feet depth of water; and all the water of the Sandy and its branches, together with the total lockage water brought from the Summit, is concentrated and rendered available for water power purposes, with a perpendicular fall of 26 feet. Mr. Gill's calculation of the power at this point, viz: 50 runs of stone during eight months, aud twenty runs during four months of the year, is not overrated; and the more business increases on the Canal, the larger will be tha amount of surplus water for the mills. Situated in a rich wheat district, surrounded with hills teeming with coal and iron ore, with water communications to the Lakes on the North, to the Mississippi on the South, and the sea coast on the East; it will enjoy easy and cheap access to all the great markets. With these positive advantages, this valuable water power must ere long command the attention of enterprising capitalists from a distance. The elements of prosperity are here, awaiting only the magic aid of capital for their complete development.

Taking into view then, the comparatively small amount of the actual investment in the Canal; its commanding position; the liberal grant of the State; and its general prospects of revenue; the eventual complete success of this important work would appear almost certain.

Permit me in conclusion, to congratulate the Board and the Stockholders generally, upon their resuscitation of this long delayed work, and upon the happy auspices under which it has been re-commenced.

I am assisted in the discharge of the duties of the Engineering Department by Messrs. Thomas J. Powers, Lot Dixon, J. R. Straughan;and Mr. D. G. Smith, Draughtsman—gentlemen of much experience in their profession, and in whose ability and integrity I have entire confidence.

All which is respectfully submitted.

W MILNOR ROBERTS, Chief Engineer,

ENGINEER'S OFFICE, NEW LISBON, OHIO,
January 31st, 1846.

SYNOPSIS OF DISTANCES.

The following synopsis of the distance, the trade of the country situated west and south-west of the Sandy and Beaver Canal would have to travel from the western termination of that work, in order to reach a market by the various routes now afforded it, or about to be, will fully justify the conclusion that it must seek a passage through it:

Distance by the Ohio Canal, Lake Erie, New York Canal and Hudson river to New York.

From the Sandy & Beaver Canal to Cleveland,	80 miles.
From Cleveland to Buffalo,	200 "
From Buffalo to New York,	515 "
Total,	795 "

Distance by the Ohio and Mahoning Canals and Pennsylvania improvements to Philadelphia.

From Bolivar to Akron,	42 miles.
From Akron to Beavertown,	106 "
From Beavertown to Pittsburgh,	28 "
From Pittsburgh to Philadelphia,	394 "
Total,	570 "

Distance by the Sandy and Beaver Canal and Pennsylvania improvements to Philadelphia.

From Bolivar to the Ohio river,	73 miles.
Thence To Pittsburgh,	40 "

Pittsburgh to Philadelphia,	394 "
Total,	507 "

Being 288 miles nearer than by the New York route, and 63 miles nearer to Philadelphia than by the Mahoning route.

AMENDED ACT.

[The following is an Act, amendatory to an Act, entitled 'An Act to incorporate the Sandy & Beaver Canal Company.']

SEC. 1. Be it enacted by the General Assembly of the State of Ohio, That whenever the sum of one hundred and fifty thousand dollars of the stock of the Sandy and Beaver Canal Company shall have been subscribed, it shall be the duty of the commissioners named in the first section of the act, entitled an act to incorporate the Sandy and Beaver Canal Company, passed January 11, 1828, and the act amendatory thereto, or a majority of them to call a meeting of the stockholders for the purpose of organizing said company in the manner pointed out in said act.

SEC. 2. That the said company shall be allowed twenty years from the passage of the act incorporating said company to complete said canal, any thing in said act to the contrary notwithstanding.

SEC. 3. That when the canal authorized to be constructed by the act entitled an act to incorporate the Sandy and Beaver Canal Company, shall have been completed twenty miles from the Ohio Canal, said company shall be entitled to collect and and receive the tolls accruing on the Ohio Canal, on all freight and passengers that may be transported thereon, and which have been transported not less than twenty miles on said Sandy and Beaver Canal to the Ohio Canal, and to receive the toll on all freight and passengers that may be transported thereon, and discharged and landed in said Sandy and Beaver Canal, at any point not less than twenty miles from the Ohio Canal, for the term of seven years from and after the completion of the twenty miles of canal aforesaid.

SEC. 4. The tolls hereby granted to said canal company for the term aforesaid, shall be ascertained and paid over to said company in such manner and at such time as the board of canal commissioners may prescribe and direct, or in such manner as may be directed by law.

JOHN H. KEITH,
Speaker of the House of Representatives.
DAVID T. DISNEY, *Speaker of the Senate.*