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"REGARDLESS OF DENUNCIATION FROM ANY QUARTER."

PUBLISHED EVERY SATURDAY AT TOWANDA, BRADFORD COUNTY, PA., BY E. O'MEARA GOODRICH.

TOWANDA:

Gatnrdan Morninn, Februarn 16, 1836.

REPORT SUPERINTENDENT NORTH BRANCH CANAL.

CANAL COMMISSIONERS.

WILKES-BARRE, January 12, 1856.

GENTLEMEN :- For a statement of the expenditures made to the close of the year end- from the river. November 30, 1855, and the amount required for the year ending November 30, 1856. ou are referred to the accompanying statement

parked A. The North Branch extension, Pennsylvania canal, extends from Pittston to the New York State line, a distance of 94 19-100 miles, following the valley of the Susquehanna to Athens, and thence along the Chemung to the State line. Here it joins the Junction canal. and by it is connected with the New York im-

The work was commenced in 1836, suspended in 1841, resumed in 1849, and reported complete in canal reports of December, 1853. The mechanical structures consist of three dams, three guard-locks, twenty-three lift-locks, two guard-gates, twenty-one aqueducts, sixteen vaste-weirs, forty-sx culverts, and ninety publie and farm bridges. The accompanying tables, marked B., give the location of the aqueducts, locks, and of the most important places on the line of canal.

In its course from Pittston to the State line, the North Branch of the Susquehanna river cuts the A liegheny range of mountains to the base, and its valley probably presents more geological and topographical difficulties than have been encountered by any other canal in Pennsylvania, and perhaps in the Union. For one-third of the distance the canal is constructed at the base of mountains ; most of the remaining distance, except where streams are crossed, the river bottom or flat is very narrow, and rises in a series of benches and with a rapid slope, generally attaining an elevation of from two to six hundred feet in less than a mile from the river.

Strata of clean gravel, alternating with sand and sometimes covered with a layer of sandy loam, is the characteristic of the valleys. Below the dam, at Horse Race, for about two miles, the gravel is not encountered, and is the only case for an equal distance on the en-

Through the narrows or points, where the river runs along the ends of the mountains, the olan of canal was to throw down the loose ock, lying at the base of the mountain, and excavate from the solid rock any additional amount required to form a bench in the river, the requisite width, to support the canal ufficiently to receive the public road on the erme. The outer bank was protected, against e action of floods, by a heavy slope wall .-The lining, to retain the water, was intended o be composed of selected earth from the desposed rock found at the base and on the enches of the mountain. This material, unless arefully selected, is entirely unfit for the obect contemplated, as experience, in the atcapts to open the canal, has too clearly denonstrated. In places where no earth or deomposed rock was left, after forming the rism of canal, lining was hauled from the flats joining. In this way the solid rock forms om one-fourth to one-half of the bottom unler the lining, with many seams and crevices, hile the quarried and loose rock make up the emaining portion, and, in some cases, the enre amount below the lining is composed of this

roken rubbish. On introducing the water into the rock secs, it filtered through the lining, when obned from the narrows; and when made from sandy loam, borrowed from the flats, it was reed by the water through the interstices long the quarried and loose rock, and breaks nd leaks were the consequence. Breaks in se portions of the canal were caused, in matances, by the rains, and in some cases xtended through the entire length of the nar-

After passing through the rolid rock in the ows, and generally at their extremities, ere the material was composed of earth mined with loose rock, and sometimes of a det of gravel, it was supposed the natural aterial would answer without lining. Here, tly, it has been found that the natural caties and water passages have been undisturband upon the introduction of water have ibited a perfect system of subterraneous ns, with a constant disposition to form dan-From breaches. At several points there was harrow flat where a tow-path was built and the water allowed to spread back to the hill mountain, where it finds a subterranean pasage through the loose mass of material to the

Through the flats, the plan of the work, as tried out, was in thorough cuts to depend on the material in place without lining, and canal; in most instances without refera selection for lining; but depending atting puddle ditches and the taking off vegetable matter on the surface, when banks, to cut off leakage.

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my instances both mucking and puddle akage along the natural surface, overflow- make a breach or wash away the residue of fields and damaging the crops adjacent; earthy matter, and leave only a stone pile resome places, where both mucking and maining. ditching were probably carried out, the

forming ponds in the hellow of the fields.

This shows the necessity for drains for the protection of the farmer, which have been made o far as the work of last season would admit. Justice would seem to award this to the man who has suffered so long the inconveniences and damages from the exposure of his crops, and his farm cut up without experiencing as yet any of the expected advantages arising from the completion of the canal.

At frequent points in the excavation through the flats, veins of water were opened sufficiently powerful to spread over the canal bottom for considerable distances, and giving it the appearance of holding; but when an additional quantity was introduced, the pressure forced the water into the original channel, producing leakage even when at considerable distances

MECHANICAL STRUCTURES.

The water-way of the aqueducts and culverts is ample and capacious; the masonry and foundations of the most substantial kind.

The aqueduct superstructures show many deviations from the plan and specifications as to the size and quality of timber, and in most instances of unfaithfulness or want of knowledge of the assistant engineers, who inspected the material; of the carpenter who put in the sheet piling, or of the foreman who superintended the puddling. In a majority of instances, failures in the sheet piling and puddling have occurred, caused frequently by the rains, and consequently have involved serious expense and delay for repairs. Several failures had occurred in the puddling before I took charge of the work.

The bottom and sides were to have been lined with a single course of jointed and seasoned plank. The hurried manner in which the work was executed, made it necessary to use unseasoned plank, and thes shrinking by exposure to the sun, left the crevices so large that it has been necessary, in most cases, to reline with boards.

A breach has occurred in the south span of Tunkhannock aqueduct, caused by the breaking of the floor beams in the middle of the span, and for one-third of its length, the water at the time wanting seven inches to run over the trunk. At the time it was being constructed this span was carried from the false works by a flood, and in the hurry of re-building, defective timber has been used. Some of the aqueducts will require considerable repairs to make them answer the desired purpose.

WASTE-WEIRS.

The remarks with reference to planking, sheet piling and puddling, applied to aqueducts, will also apply to waste-weirs. Three new ones have been constructed the past season, at points where accidents had occurred, because of no means of discharging the surplus water, and additional gates inserted in others, so that in case of accident, the water can be suddenly drawn from the canal, thus reducing the liability to heavy breaks.

At Athens and Towarda the guard locks and in some instances the rock was cut back ing are of the composite kind, with dry stone walls lined with a single course of jointed plank. Shrinkage of the plank had allowed the water to pass through the spaces and wash out the material from the rear of the walls, rendering caulking with oakum or lining with boards ne cessary in most cases.

> The hanging of the gates and valves, or wickets, the repairs to those on the Tioga line, that were completed before the suspension in 1841, the puddling and the feeders or waterways around the locks, show the same want of care in superintending and defect in material, as was manifested in the construction of the

> With the exception of the out-lets at Pittston and Meshoppen, where the foundations have yielded, the masonry seems to be sustantial. The former being a quicksand foundation, has required considerable repairs, which could not be completed while the water was in the Wyoming line of the Lower North Branch. Several of the water-ways will require re-building, having been undermined by the leakage of the water through them. Three of the locks will require a lining of boards.

The dams have a flat lower slope, which prevents their undermining from the reaction of the water, thus ensuring their stability, and when the angle or corners adjoining the abut-ments are once secured with cribbing, the usu al repairs for gravelling, and the wear of the timber, will be all that is required.

Dam No. 1. located at Athens, supplies the canal with water from the Chemung to the pool of Towanda dam - - - - - 13 31-100

MILES

Dam No. 2, located at Towarda, is intended to feed the canal to the pool of Horse Race dam - - 38 am No. 3, is located at Horse Race, is to furnish the supply until it joins the Lower N. Branch at Pittston 32

CONDITION OF CANAL AND REPAIRS. When the canal was suspended in 1841 thirty-two and one-half miles were completed, most of the remainder under contract and in different stages of progress. Since this time, these finished sections have been exposed to side cuts and fills, making use the material the action of frost, expanding the mass, thus the adjacent cuts for forming the prism giving a free circulation of air through the pores, by which the vegetable matter was destroyed, while the rains have washed away the finer particles of earth from the lining of the sections through the narrows into the coarse material below. The gravel sections have also been rendered porous by the same means. s were dispensed with, as is evident from The water being admitted in either case, would

Similar difficulties have been experience in has sunk through the pervious strata at the works of an adjoining State, as will be compressed in quickness and amount, in pro-

its appearance at some distance from the canal, | port of New York State Engineer and Sur- and other banks are formed in layers. This

eyor, page 188.
"The great number of failures in the old banks of the canal that have occurred the past where the vegetable matter in the soil has

"Nine years have proved sufficient time to work great changes in the solidity and compactness of the old banks. It is, therefore, recommended in all cases where the old banks are found, to remove the sod to the outside. and plough and comminute thoroughly, to the depth of twelve to eighteen inches, the material over the bottom and up the slope of the prism. This will be found indispensable to safety. The heavy breaks that have occurred since the opening of navigation last spring, were exclusively through the old banks, and uniformly disclosed a loose condition of the material."

Like results are found in old mill races, and it is confidently believed that the same would be exhibited, if water should be excluded for a few years from any of the old and established lines of canal.

The short time that elapsed after my appointment in the fall of 1854, before the setting in of winter, and the pressing duties that devolved upon me, made it necessary to rely, in a great measure, on the information obtained of those who had charge of the line, and of the foreman who had the season to make observations, and who had been superintending the repairs, for the condition in whichthe work

was at that time.

They supposed the leakage in the narrows or rock sections confined to a few points, generally well defined, and sufficient to account for the disappearance of the water.

In the "light sections," where the cutting had exposed strata of coarse gravel, in some instances of cobble stone and clean river gravel, it was evident that unless these were removed and finer material used, that the water would continue to follow the line of natural drainage of the country, as it had done for centuries, and as it obviously did when the experiment was made by introducing the water, and as was realized at every rain storm.

In making the repairs the past season, every known expedient has been brought into requisition, as the peculiar features of the case demanded. But in general, the tediousness, expense and unreliability of over hauling with 'pick and shovel," or excavating from the bottom and side replacing with new material, made it necessary to adopt some more expedi-

tious and economical plan.

Accordingly, a force was employed at every point where water could be introduced from small streams, and wherever the nature of the material would require and it could be executed, the ground was ploughed, and the stone late opening of spring, and the rainy season, and coarse material exposed in the furrows, or had confined the time for work of those engagbrought to the surface by the frequent appli- ed in agriculture to so short a period that sufremoved outside of the prism of canal. In be derived. this way the exceptionable portion of the material only was removed, and that more care- and the upper portion of the Lackawanna and fully selected substituted, and room left by the Bloomsburg railroads were rapidly approachremoval of the coarse material for an addition- ing completion, an advance of prices to the conal quantity of lining, if found necessary. A tractors in many instances depending on the heavy cast iron roller was applied both before completion of their work within a given periand after the admission of water, for the purpose of compression, instead of the usual mode with commanders. It was supposed that the lining was such, that by overhauling the surface in this way, leaks would be exposed and the finer material left would be sufficient to cult to obtain hands at the proper time, and render that below impervious. The rains much more so to obtain the proper product of showed the porous character of the material labor. such, that it was afterwards found necessary. in most cases, to move it to a greater depth both in the narrows and light sections, where gravel occurred, than had been contemplated, thereby causing unexpected delay and expense

MECHANICAL ACTION OF WATER ON EARTH. The idea has been frequently advanced and reiterated, generally by those who had been engaged in the construction of the most defectire portions of this canal, and who in addition to their experience on this, claimed knowledge gained on works for a similar purpose, "that all that was necessary to form a good and perfectly tight canal, was to allow the water to pass into it, particularly when in a muddy or riley condition from freshets; that the earth then carried forward in solution would be deposited in sufficient quantities to prevent leakonly apply to the vicinity of the dams on the levels, as the current is not sufficient to carry the sediment but a short distance, leaving the remaining places to be stopped by other

Soil being constituted of decomposed rock and broken down vegetable tissue, comprising particles all shapes and sizes, from stone and gravel to the finest powder, these particles, in a state of nature, resting upon and against one another, form a system of irregular cavities or arches. But upon being broken up or moved, a portion of the vegetable matter pas-ses off in the form of gases; and when in this pulverized condition, if water is kept in con- ture of over ten thousand dollars, which, if the tact it percolates through the mass, displaces or destroys the adhesion of the particles, and gradually brings them into a smaller space, while, the solvent property of the water reduces the portion in immediate contact, or the external surface into the state of thin paste, larly to the formation and material through which is drawn into the mass by the percolation of the water or capillary attraction, until the external pores become clogged or impervious, according to the character of the mate-

rial used. This process is gradual and slow in its operation, depending for its rapidity upon the character and situation of the materials.

But if weight is applied, the soil will be the strata runs out to the surface or is the strata runs out to the surface or is adjusted of an impervious nature, makes the disconting state, as will be compressed in questions and to the quantity of material and to the quantity of material and to the seen by the following extract from the report weight. This is the operation of puddling; the strata runs out to the surface or is adjusted in the surface or is disconting the provious strata at the works of an adjoining state, as will be compressed in questions and to the quantity of material and to the weight. This is the operation of puddling; weight. This is the operation of puddling; the works of an adjoining state, as will be compressed in questions and to the quantity of material and to the weight. This is the operation of puddling; the strata runs out to the surface or is of J. B. Stillson, engineer and surveyor of adjusted the most than a sufficient corps of assistants than was water, have, it is believed, developed the most than a sufficient corps of assistants than was water, have, it is believed, developed the most than a sufficient corps of assistants than was water, have, it is believed, developed the most than a sufficient corps of assistants than was water, have, it is believed, developed the most than a sufficient corps of assistants.

happens also when a head of water is main-tained in the canal. The roller has been used, because it produces the same results in a shorseason, show conclusively that old banks are less safe than new ones. Banks annually used and made impervious by sedimentary matter drawn into and deposited as a lining on the face and bottom, will undoubtedly become more and more safe, but when left to the action, from its weight being greater than the more and more safe, but when left to the action of rains and frosts for several years, become porous and unsafe, and abound with cavious greater compactness. The results, from the practical operation of this plan, have reailized all that theory would claim.

So long as pressure is constantly renewed. the mass will be kept in its compact state; but if it is removed for a long period, and exposed to the frosts of winter, the earth is again brought back to a porous condition, and the sooner if in a thin layer like the lining of a canal, or in banks where a greater amount of surface exists on which to operate.

It is on the theory of the porosity of soils that the subject of under-ground drainage is the depth of three feet afford drainage; filters composed of layers of sand and gravel to the depth of six feet, afford supplies of water for large cities; the reservoir of Nottingham, England, is excavated at a distance of one hundred and fifty feet from the river Trent, yet receives its supply by percolation of the river water. The practice of ballasting railroads, and the whole theory of wells and springs, rest upon it, and the instances are not wanting wherein old and well established canal leaks can be found that have existed for years, and show no signs of stopping. Can it therefore be reasonably expected, that in a work of such long standing, a lining of three feet, resting on a bed of loose rock or a cut through strata of cobble stone or gravel, will now become impervious to water, unless carefully selected and presenting the smallest amount of pores?

DIFFICULTIES ENCOUNTERED IN MAKING REPAIRS. Several times during the winter, and early n the spring, attempts were made to organize force for the commencement of repairs, but the unusual character of the winter, and late opening of spring, prevented the beginning of effective work until April. The frost had penetrated an unusual depth, and owing to the repeated freezing and thawing, and the continued rains during the season, an immense amount of bars and slides had to be removed The slides and breaches have cost eighteen

damages to the mechanical work. Besides this, the alternative presented itself of working to disadvantage in the mud and water produced by the rains, and in the feeder level by the floods, or disbanding the forces.— The result has been that much of the work cost more than double what it would have done under ordinary circumstances.

thousand and eighteen dollars, exclusive of

SCARCITY OF LABOR.

The line having been represented as finished, the laboring force had left for other works, and the shanties had been demolished. The cation of the harrow, collected by rakes and ficient assistance from that quarter could not

The Delaware, Lackawanna and Western, od, the construction of new colleries and lateral roads in the coal regions, and the building of a railroad from Towanda to the coal mines of the Barclay coal company, all created a demand for labor, making it exceedingly diffi-

To the high prices of provisions caused by the failure of the crops, was added the necessity of procuring supplies from the State of New York and Pittston. Shanties were erected at suitable points, yet much difficulty was experienced in obtaining board for the men-preventing the employment of large forces at some points where it would have been desirable.-The lock-houses could not always be rendered available, since there had been no settled arrangement with the landholders for the lockhouse lots. The promise of payment not being complied with, they, in some cases, unwilling to give up possession, and the tenants occupying the houses, would not consent to board

Another difficulty was to secure experienced foremen. Those who had been employed in age." Unfortunately for the theory, it would introducing the water into other canals, were engaged in other pursuits, and could not be obtained for the compensation allowed by law. Higher rates are paid by contractors, and experienced men will not work for the State at the same compensation as for individuals, because of the uncertainty attaching to their position, and the annoyauces to which they are compelled to submit.

To this should be added the fact that in many cases it was found necessary to do a large amount of work where but little was anticipated. One case may be cited :- Below Horse Race dam repairs were found necessary, which consumed most of the season, and an expendisupposition of those who had had it in charge were correct as to its condition, not one-fourth of this sum would have been required.

Although the difficulties that have delayed the opening of the canal belong more particuwhich it passes, it is useless to deny the fact, that there are numerous defects in construction, most of which may be attributed to mistaken, but perhaps laudable, notions of economy that prevail in regard to the necessary corps of engineers and superintendents required to ensure the proper construction of the canal.

tants on the line, many of whom, on account canal could be made available.

necessary, to have carefully measured and esti-mated the work, while to have ensured a pro-per quantity and quality of material, there should have been, particularly in the rock sec-tions, while the lining was being put on, an experienced and faithful superintendent on each section. In this way alone could have been section. In this way alone could have been prevented improper construction by contractors, whose object and policy was profit, without reference to the quality of the work. This would have prevented lining, variously intermixed with stone; drains left remaining which had been constructed to carry off the water, brought in by rains and rivulets; the burying of the remains of shanty foundations, stables, ovens, and even horses in the lining and embank-

Where such superintendents could have been obtained, would perhaps have been a difficult question. The sworn assistants of the chief engineer were in all cases to require the puddle ditches and mucking to be kept in advance of the work, and the level and tape applied throughout the sections before making the fifounded. Even in clay soils, tiles buried to nal estimate of the work; yet numerous cases the depth of three feet afford drainage; filters exist where the prism of canal was not cut down to bottom, or the required width, where the solid and quarried rock came nearly to canal bottom, and where the mucking and pud-dle ditches, under banks, could not have been performed, as the overflowing ditches at the base of the banks, or the destroyed crops of the farmer will testify.

PASSING THE WATER THROUGH THE CANAL.

In passing over the canal in the latter part of October, 1854, I found the gates of Athens lock wide open, and the whole Chemung river, so far as it could be controlled by the dam, passing through the upper level; and at the first lock below the dam, all the wickets and the water-way were open to supply the re-maining six and four-tenths miles of canal be-

At Towarda there was about six and onehalf feet of water on the mitre sill, and thence the water gradually diminished from leakage and filtration until it disappeared in the vicinity of Wyalusing creek, nineteen and one-fourth miles from the dam. It had previously been to the public bridge across the canal, threefourths of a mile lower down. The water had been repeatedly withdrawn for repairs of small breaks, which were constantly occurring, and each succeeding attempt resulted in the falling back of the water. The cause is now evident : the longer the water was applied the greater the quantity of material washed out from the lining into the coarse material beneath, for the reasons before given; and it is evident that with the same plan pursued for years, the canal could not be filled until most of the porous material should be removed.

At Horse Race dam the depth of water on the mitre sill of the lock was six and one-half feet, and terminated at the Osterhout narrows, sixteen and one-half miles below. It was again introduced from the Buttermilk Falls creek, and passed through that level until it terminated by a subterranean passage in Townsend's creek, covering a distance of about four miles.

THE PRESENT SEASON. The continued rains and slides during the past season, prevented the necessary repairs to that portion of the canal above Towarda being made for the admission of water until early in August. It was maintained in navigable order

to the close of the season without any breaches. From Towarda dam the water was passed to Laceyville, thirty miles, and from thence to Meshoppen, by means of the Tuscarora feeder. The levels could have been filled up to four feet to the lock below Browntown. From Horse Race dam the water extended to the narrows above Gardiner's ferry, leaving a space of over one mile before reaching Gardiner's Creek feeder, from which point it was carried to its junction with the Wyoming line.

Various circumstances prevented the filling of the levels. Symptoms of a break at the culvert below the lock at the head of Osterhout's level, prevented putting in more than two feet and six inches of water. The falls level, in consequence of the breaches recently repaired in the Roberts narrows, was not allowed to carry more than the same depth of water. It was impossible to fill Falling Spring level, because of the subterranean passages existing in the first mile above the Lackawanna acqueduct.

In the repairs on this canal, I have only had in view the opening for successful navigation with full loaded boats as speedily and certainly as the character of the work and the difficulties encountered would permit; and if the same system of repairs are pursued for a series of years, its capacity will be materially increased. Where bars have been removed, the waste material has been placed so as to widen and give stability to the banks. If earth was want ing to strengthen the banks, or fill in the bottom, it has usually been obtained from contracted portions of the canal, the extra expense being only for the distance moved with boats

When holes were cut through the tow-path bank for drainage, to prevent its annual repetition, for removing bars, a wooden trunk, secured with sheet piling and a gate, has been those having the work in charge.

OPENING OF NAVIGATION.

Many of the friends of the canal have been xceedingly anxious that a boat might be got through the past season, with or without a partial load; and to accomplish this that every temporary expedient should be resorted to, regardless of any future expense or delay, in pects of the work. Although it might have facilitated the appropriations, the result would have been a delay in the passage of full loaded boats, an increased expenditure for years, disappointments and loss to those who have made investments, with the view of doing business on or connected with the canal, and only serve the close of the fiscal year, and subsequent to encourage the building of a railroad as a There has been a constant change of assis- competitor along the same valley, before the Board until the present time, an account of

defective portions of the conal, which have been repaired so far as the lateness of the season and the character of the repairs required would and the character of the repairs required would permit, while the remaining ones, though involving a considerable amount of labor and expense, are confined to comparatively few points. Some of the repairs can be made during the winter. On the opening of spring the water can be admitted into many portions of the canal, and gradually filled as suitable material is placed in the bottom and upon the sides, by means of boats. In other cares material must means of boats. In other cases material must be hauled with teams, and it is difficult to say what force of teams and labor can be commanded. I can see no difficulty, after the contemplated repairs have been perfected, the ensuing season, in passing loaded boats. Although the friends of the canal anticipate a large trade, but few boats have been built with the view of transportation upon it, and strong inducements be held out to withdraw them from the other Pennsylvania canals. It is not probable that the owners of line boats on the Erie canal, who have visited the North Branch with the view of transferring them, will do so until it has been ascertained, by actual boating, that the piles of stone and rock, and stone berme banks that adorned the canal, have been removed. DELAWARE AND NORTH BRANCH DIVISIONS.

The early history of our State canals seems to be forgotten. The Delaware division, now yielding about twenty per cent. on cost, had difficulties to encounter. The Caual Commissioners, in their report dated Dec. 15, 1831, under the head of old lines of canal, say : "At the last annual report of the Canal Commis-sioners, December, 1830, in speaking of this division, they say, that the filling of the canal for navigation, in its whole course, began Oct. 1830, and that twenty-five miles are navigable but they add that a part of the work first con-structed has proved defective and requires extensive repairs. This last observation has been verified by the fact, that since that time, the two supervisors on the Delaware division have expended \$97,339 51 on repairs and introducing feeders, and the whole line is not yet open for navigation. The original plan and construction of large portions of this division have proved exceedingly defective, and although ev-ery exertion has been made throughout the year by the officers of the line to fill the whole canal with water, yet their efforts have heretofore proved unsuccessful." The Durham creek ten miles below Easton, was introduced, by r feeder 1,890 feet long by 12 feet wide; and Milton creek, near Lumberville, by a feeder 1,509 feet long, besides temporary feeders on sections 54 and 61. Boats were passed in the fall of 1832, but could not carry full loads .--The tolls received amounted to \$8,043, and the expenditures to the close of 1832, \$191,514 00. to which should be added during the year 1833 \$83,000. The original estimate for the cost of this work was \$687,000, and the actual cost was \$1,203,165.

Similar difficulties were encountered on the Lower North Branch Canal, as well as the canals belonging to the Commonwealth generally, as will be seen by reference to the communications of the Canal Commissi 1830 to 1835

The North Branch extension has many advantages not enjoyed by the other Pennsylvania canals viz :

It is located above high water mark, with a heavy slope upon the size next to the river, thereby rendering it secure against the action of ice and floods.

The aqueducts and culverts are built of substantial masonry, and have capacious and ample water-ways for the passage of the streams. The plan of dams will insure stability.

It is true that years of well applied labor will be required to perfect the canal: that sinks in the bottom, small breaches and slides from the hills will frequently occur, but much of the danger of slides can be prevented by building cribs and filling with stone, or driving piles at the base of the hills, and by surface ditches to collect and carry off the water, for which purposes the frequent examinations made during the rains of the past season, have afforded ample opportunities for observation, to ascertain their proper location. Sinks in the bottom and breaches will gradually diminish by vigilance on the part of those having the canal in charge.

It has been urged against the success of the North Branch canal, that the strong current against the boats ascending it, will increase the rates of transportation to such an extent as to prevent a successful competition with the Lackawanna and Western and Eric roads. carrying coal from Scranton, or the Sunbury and Eric and Williamsport and Elmira roads from Shamokin.

The resistance to ascending boats can be much reduced by gradually widening the contracted portions of the canal, the introduction of Wyalusing ereek as a feeder, the construction of a reservoir on Tuscarora creek, the maintenance in the spring and fall of all the temporary feeders now in use, and the continued tightening of the canal by attention on the part of

The extra charge for freight, will be for horse power alone. The expense of boats and hands will be the same as on other canala.

The competing railroads, unlike the Reading, with its descending grades, have mountains to cross. The coal carried by the North Branch, is of a different quality, and will, therefore, have its market. The canal, if kept order that the Legislature might be induced to in suitable condition, with proper management, grant more readily the funds requisite for its will command its share of coal tonnage, be service the ensuing year, by congratulating sides a large miscellaneous trade; will have a them, in the usual manner, on the future pros- revenue in excess of the expenditures after the present year, a result not attained on the most productive State canals for several years, and increasing with the facilities afforded, until the revenue exceeds that of any other canal in

Pennsylvania. The unexpected difficulties encountered after sickness, have prevented my submitting to the the line under my charge during the past year.

Respectfully submitted.
W. R. MAFFET. Engineer and Supt No B. Court