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ANNUAL REPORT
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New York (State) Canal commissioners

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THE

ANNUAL REPORT

OF THE

Canal Commissioners

OF THE

STATE OF NEW-YORK,

PRESENTED TO THE LEGISLATURE,

MARCH 4, 1825.



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1825.

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REPORT, &c.

To the Legislature of the state of New-York, pursuant to the act, entitled "an act, respecting navigable communications between the great Western and Northern lakes, and the Atlantic ocean," passed 15th April, 1817, the Canal Commissioners respectfully report :

The commencement of the last season was like the one which preceded it, remarkable for continued rains, and the contractors on the western and unfinished part of the Erie canal, did not make much progress until late in the month of June. From that period until the beginning of winter the weather was favorable, and the work has been vigorously and successfully prosecuted.

The line of canal from Brockport to Lockport, was so far completed as to be in a suitable condition to receive the water about the eighth day of September, and boats passed on this part of the line on the twenty-fifth.

The feeder taken from the Tonawanta and Oak Orchard creeks, was the only resource for a supply of water west of the Genesee river, and although it was in the season of the year when the quantity of water in these streams was small, and there was scarcely a rivulet in the country which gave any aid, and the bottom and banks of the canal had become somewhat porous, by being finished and exposed to the influence of the sun, and consequently absorbed a great deal of

water, yet our most sanguine expectations in relation to the value of the feeder, were fully realised. It was found to be sufficient to afford a navigable depth of water from Brockport to the foot of the mountain ridge. But in consequence of the almost impassible condition of the roads, for loaded teams from Lockport to the Tonawanta creek, all the property passing on the canal destined for the country west of Lockport, left the canal at Brockport, and was from thence transported in waggons.

The importance to the state of improving this road so as to accommodate the spring business on the canal, was so apparent, that, on a representation to the legislature at their fall session, they made an appropriation of one thousand dollars for this purpose, which has been applied in such a manner as to place it beyond a doubt that a road will be made, to accommodate the carrying of freight, on the opening of the canal in the spring. The extent of this portage from Lockport westward will be about five miles; from which place property may be taken in boats on the canal into the Tonawanta creek, and Niagara river. The difference in the expense of transportation on this arrangement will be sufficient to induce carriers to continue on the canal, and will very considerably improve the revenue for the next year.

The admission of the water into the canal between Brockport and Lockport, gave a flattering test of the solidity and permanency of the works. At Sandy creek, Otter creek, Fish creek and Oak Orchard creek, are embankments of considerable magnitude. For their security, safety gates were placed in the canal at each end of them. Across the Oak Orchard creek an aqueduct of sixty feet span has been constructed of

stone, in the most substantial manner, and there are on this part of the line thirty-seven culverts of stone masonry, and one road culvert.

In the fall of 1823, about three miles of the line of canal from the Tonawanta creek, eastward on the mountain ridge, was subdivided into sections of about twenty-five chains each, and placed in the hands of experienced contractors, under the impression that the work might progress during the winter; but the weather was extremely unfavorable, and there was constantly such a quantity of water on the whole of this work, as to forbid the attempts of doing much. The contractors, however, availed themselves of the favorable state of the roads in transporting stores of subsistence, and making the necessary preparations for a vigorous commencement of the work, as early in the spring as circumstances would admit. The earth until late in May continued to be covered with water, and it was not until after ditches were cut on both sides of the canal to carry off the water from the swamps and small streams, and a heavy expense of pumping incurred, that the line could be placed in a suitable condition for carrying on the work.

The surface of the water in the Tonawanta creek, is ordinarily about one a half feet above the bottom of the canal, but this season, until about the first of August, it was more than three feet; consequently, no method could be adopted by which the water could be drained without pumping. To surmount this difficulty, a ditch was made on the towing path. Pumps, worked by horse power, were introduced on almost every section, to throw the water on the towing path, on which it was conducted, for more than three miles into the Tonawanta creek. As the excavation pro-

gressed, the water increased by an accession from springs. Great exertions were made to bottom about three miles of the canal from the creek eastward, for the purpose of making it navigable early in the season, and under the conviction that, unless this was done, the expense of disposing of the water next spring, would be very great. Two of the contractors, however, on the first two miles, did not succeed in finishing their jobs until the heavy rains, early in November, drove them from their work. The bottom, however, is so nearly excavated as not to prevent the passing of boats in the spring, and may be useful for the purpose of navigation, until a drain can be obtained to the brow of the mountain, after which the work may be finished. The excavation on the next mile is completed, with the exception of about five thousand yards of rock, which is placed in a condition for a winter's operation, and may be finished by the first day of April. On the remaining earth sections, there were about eighty thousand yards to be excavated, on the first day of December. The largest of these sections has been subdivided and placed in the hands of several contractors, who have engaged to complete their contracts by the first of July next. In the deep cutting of earth on the mountain ridge, we have to encounter quick sand, the removing of which will be expensive, but is not of so formidable a nature, as to present any serious obstacle to its completion. Some parts of the banks appear inclined to slip, which may render it necessary to secure them by docks of timber or walls of stone.

Rock sections No. 1, 2, and 3, are completed; on section No. 4 there remained on the first day of January three thousand five hundred yards. On section

No. 5, twelve thousand five hundred yards, and on section No. 6 there are probably twenty-eight thousand yards of rock, and twelve thousand yards of hard pan: on this section we have not succeeded in doing as much as we expected, and this will probably be the finishing point on the canal; our greatest exertions will of course be directed to this point. The character and capacity of the contractors on this section, give a reasonable assurance that proper exertions will be made to press forward the work, and we trust it will be finished by the first of September next. The combined locks at the brow of the mountain, are nearly completed. This is a work of the first magnitude on the line, and one of the greatest of the kind in the world. The superior style in which it is executed—its situation at the brow of a perpendicular precipice of about seventy-six feet, overlooking a capacious natural basin, with banks on each side of an altitude of more than one hundred feet, connected with the deep rock excavation, renders it one of the most interesting points on the Erie canal.

The towing path on the bank, and the dam across the Tonawanta creek, are finished. The lift lock located in the side cut which connects the canal navigation with the Niagara river, is also completed: the guard lock on the west side of the Tonawanta creek is ready for use, and boats have been towed on the twelve miles of the Tonawanta creek, and passed through the guard and lift locks into the Niagara river.

The contractors on the line of canal between the Tonawanta creek and Black Rock, have prosecuted their work successfully, and this part of the line will be finished early in the season.

The line of canal from little Buffalo creek to its in-

tersection with the Black Rock basin is in a state of considerable forwardness. This line being greatly incommoded by water proceeding through a porous soil from the lake, and from springs near the bottom, the difficulties of which materially increase as you approach little Buffalo creek, is expensive.

The contractor who had charge of the rock excavation adjoining the Black Rock basin, in extending his work to a sufficient depth to answer the purpose of navigation, had to encounter serious difficulties. As he approached the margin of the river, the rock became shelly, and the seams between the strata so open as to admit of large quantities of water whenever the excavation was sunk below the surface of the river; and notwithstanding proper precautions were taken by building dams around his work, it was frequently inundated by the sudden rise of the lake.

The Black Rock harbour company have prosecuted their contract with energy and success; and although the whole work is not completed, it is in such a state of forwardness as to render its completion by the time of the finishing of the other work, certain. The sloop lock is nearly finished, and the dam connecting the main shore with Squaw Island is raised sufficiently above the surface of the water to prevent it from passing over. The embankment on Squaw Island was finished early last summer; it is eight feet high, the breadth at its base is more than thirty feet, and at the top, six feet: and when we consider that this embankment will have about one year to settle before a head of water is raised against it, and that this head at the foot of the basin will only be about two feet, it is evident that it is more secure than ordinary canal embankments.

From the head of Squaw Island to the temporary dam is an extent of four thousand one hundred and eighty feet of pier, which is about three fourths filled with brush and stone. The contractors intended to avail themselves of the ice within the basin to fill the remainder during winter. From the temporary dam to the first angle of the traverse pier, is a distance of three thousand three hundred and fourteen feet of pier, which is filled with brush and stone, and is trenailed, but is not in all respects finished. From this point there is an open space of about one thousand feet, part of which, when completed, will form what is termed the traverse angle, stretching nearly at right angles with the stream, and will with about six hundred feet of mole or pier put down in 1823, complete the whole work. The greatest proportion of materials requisite to complete what remains to be done has been procured.

About the 20th of October last a temporary dam was thrown across from the shore to the mole, for the purpose of facilitating the progress of the work at the lower extremity of the harbour, in building the dam and sloop lock, and to aid them in the work connected with the filling of the mole, by making still water above and below the temporary dam. By this operation a head of water was raised on the temporary dam and the adjacent mole, which augmented by a heavy swell from the lake, created a lateral pressure, which had the effect to carry away the upper timbers of about seventy feet of the mole. This part of the mole was not filled with stone, nor were the timbers trenailed, and was in every respect in an unfinished condition. It has been repaired by the contractors at a trifling expense, and cannot be considered as any test

of its durability when completed. This mole has been sunk in an average depth of about fourteen feet of water, and in a current of from four to seven miles an hour, and it certainly is very fortunate, that in sinking about eight thousand feet of mole under circumstances liable to accidents, so little damage should have been sustained.

It has been supposed by some, that these works when completed would not elevate the water to the level of the lake, and that consequently we should incur an expense of excavation in crossing the mountain ridge, which might have been avoided if the canal had been fed from the lake, through Buffalo creek. The construction of the temporary dam, which is put together without much regard to its tightness, and the effect it has produced in elevating the water to within six inches of the level of the water in Buffalo harbor fully demonstrates the practicability of sustaining the level of the lake, and of even obtaining a higher surface of water at the foot of the basin, than there would be in a separate canal, at a point opposite on the plan of feeding through Buffalo creek; and that instead of taking a lower level in crossing the mountain ridge, it is quite probable that the level might have been raised a few inches.

On the 21st and 22d of December last, when the weather was favorable for the purpose, the engineers were directed to take the level of the water in Buffalo harbor at a point nearly opposite Bird Island, in the basin above and below the temporary dam, and below the dam and sloop lock at the lower extremity of the harbor. The levels taken on the two successive days varied but little, and produced the following results. The water in Buffalo harbor was $5\frac{9}{10}$ feet above bot-

bottom of canal—at a point a little below Bird Island, and one mile and three quarters below Buffalo harbor, the same. In the basin above the temporary dam, $5\frac{4}{10}$ feet above bottom of canal, making a descent of a little less than six inches from Buffalo harbor. Below the temporary dam, $2\frac{3}{10}$ feet above bottom; fall three feet one inch; below dam and sloop lock $1\frac{5}{10}$ feet above; fall nearly a foot,—whole descent from Buffalo harbor $4\frac{4}{10}$ feet. Thus it will be seen that notwithstanding there is an open space of about one thousand feet above the temporary dam, and the mole is in an unfinished condition, there is less than six inches difference in the level of the water in Buffalo creek, and the basin above the temporary dam.

On the plan of taking a supply of water from the lake through Buffalo creek, and a canal independent of Black Rock basin, there was a descent of one inch to the mile; and it being about four and a half miles from Buffalo creek to the lower extremity of the Black Rock basin, the surface of the water at this point would be four and a half inches below the lake level. If, therefore, the level of the lake can be sustained in the basin, there will be a higher surface of water by four and a half inches; and in addition to this, it is more than probable that the obstruction formed in this branch of the Niagara river, will raise the water in Buffalo harbor a few inches, which would be an additional gain of elevation.

Since this work was commenced, our confidence in its utility and permanency has increased.

The Erie canal was not navigable as early the last season as usual: the winter preceding was remarkable for frequent and sudden changes of weather, and the ice of the Mohawk was broken up three or four times

by thaws and floods. In one of these floods the dam across Bowman's creek, which is connected with the canal, was undermined by the water, and in part carried away, together with the towing path bridge which stood over the creek. Other bridges of this description were damaged or swept away, and a small breach from this, or some other cause, was made in the embankment on the margin of the river near Van Olin-da's.

These were the most considerable injuries which the canal sustained during the winter; but the sudden thawing of the earth, attended with a heavy rain in the month of April, precipitated into the canal from the high banks which adjoin it in many places, and particularly near Amsterdam, an unusual quantity of clay and other earth.

Preparations had been made during the winter for making repairs along the whole line of the canal, by drawing materials to the places where they were required, engaging teams and laborers, and in purchasing the necessary implements; and the work was every where commenced and prosecuted with spirit, as early as the season would permit. The rebuilding of the dam was carried on in the most inclement weather, and although the workmen were frequently driven from their work by floods, they succeeded in completing it before the navigation opened on the adjoining levels. The earth which had fallen into the canal was not, with our greatest exertions, entirely removed before the last of April, between which time and some of the first days of May, the water was admitted throughout the eastern section, and the navigation which had been open to the westward some days before, was extended from Brockport to Albany. The

cold of winter had lingered later than usual, and in several places along the Mohawk, under the steep acclivities which overshadow the canal, frost was found in the banks some weeks after the admission of the water. To prevent the dangers which arise from the penetration of the frost into the banks, and into the earth around the culverts, and at the ends of the aqueducts, and also to avoid the delay in the opening of the navigation which this circumstance occasions, it is our intention to keep the water in the canal during winter, and to draw it off only for the purpose of making repairs in the spring. Hitherto, the new and unsettled state of the banks would not admit of our adopting this precaution on all parts of the canal.

Several breaches occurred in the early part of the season; they were, however, soon repaired, and the navigation continued until near the middle of December without any material interruption; and in no former season have the banks stood so well, nor has the canal been so fully and equally supplied with water.— Some inconvenience was, however, experienced in crossing the Cayuga marshes. The canal is there connected with the Canandaigua outlet and the Seneca river, and on the subsidence of these streams in the latter part of the season, the water in the canal was reduced below its proper height, and loaded boats were frequently detained. To prevent a recurrence of this difficulty, we are now engaged in constructing a lock with a lift which will sustain the water at an elevation suitable for navigation at all times; and it is our intention to have it completed before the navigation opens.

The great embankment at the Irondequot has afforded evidence of increasing strength and solidity,

but we have not thought it prudent to abandon the precaution of watching it unceasingly. The next great embankment situated near it, in the early part of the season, gave some indications of a failure ; measures were promptly taken to strengthen and secure it, and it is now considered perfectly safe.

Repairs have been made in securing culverts and aqueducts, in altering bridges and in raising embankments in various places. The banks which are composed of loose and light soils are wearing down at the surface of the water, and the towing path has been so much narrowed in several places as to require enlarging and securing with a facing of stone on the inner slope of the bank. From ten to fifteen miles has been done in this manner the last summer ; and it will be necessary to continue this work from year to year until the banks are permanently and fully protected throughout the whole extent of the canals.

The bridges which were built on the middle section on the plan first adopted, have mostly been altered and enlarged ; and the remainder will undergo the same alterations during the present winter. The want of greater height in all the bridges has been the subject of complaint with passengers in packet boats ; and they are indeed considerably lower than when first constructed, in consequence of the settling of the banks. It was intended that there should have been not less than eleven and a half feet space in all cases between the bottom of the canal and the underside of the string pieces. This height allows of seven and an half feet above the surface of the water, and affords room for the passage of the largest boats. A greater elevation would have greatly increased the expense of embanking and forming a road to ascend the bridges ;

and would also have added to the inconvenience of the farmer through whose grounds the canals have been constructed, and for whose accommodation the greatest part of them have been built, and who is now obliged, in passing many of the bridges, to carry the ponderous and bulky productions of his farm over high, narrow and dangerous embankments. The insuperable difficulties which opposed the construction of these bridges at an elevation sufficiently great to admit persons to pass under them without danger or inconvenience, on the decks of passage boats, produced suggestions at an early period from various quarters, of building them on the moveable or retractile plan. The advantages of bridges of this description are, that they can be so constructed as to rest on the water, or at an elevation but little above it; and that they may be thrown across the canal and returned again by the strength of one man. And when not in use, they may be thrown out of the way. The objections to them are, that when in use and thrown across the canal, they form a barrier which totally obstructs the passage of every boat. And although they may be placed out of the way, it is not probable that they always would be; but would be often in a situation to obstruct the navigation, or to be broken in pieces by the impingement of heavy boats. Bridges of this description may be well adapted to canals over which few bridges are wanted; but we apprehend that they are altogether inadmissable on canals over which such a multitude have been required as on the canals of this state; and through which such numbers of boats will continually pass. Between Utica and Albany there are nearly three hundred bridges; and of these, more than eighty are between Utica and the Little Falls, averaging four to

every mile. These bridges must be used many times every day, and had they been constructed on the retractile plan, no boat could have passed upon this part of the canal, without experiencing the most vexatious interruptions: and not less vexatious and intolerable would be the inconvenience and labour which they would impose upon the farmer whose cows, horses, oxen, sheep and other stock or property could never cross the canal, neither could his children or his family pass it, without the assistance of at least one able bodied man to move and remove the bridge every time it became necessary to pass any of them over it.

By a reference to one of the documents which accompanied the first report of the present board, it will be seen that two of the canal commissioners and two of their engineers visited the Middlesex canal in 1816; and among the items of information which they obtained and communicated, is the following. "At Medford is a swivel bridge, which is found to be very inconvenient." In consequence of the difficulty and expense of building an immoveable bridge across the canal at the Oriskany hill, a retractile, floating bridge was built three years ago, which was found, however, to be equally inconvenient as the swivel bridge above mentioned, and was in a short time entirely knocked to pieces by the boats.

The breach in the dam across the Hudson river above the city of Troy, was found to have been enlarged by the action of the spring floods about one hundred feet.

A considerable part of the small island, called Adams island, situated immediately below the breach, was washed away, and the current appeared to incline to abandon its old course along the east side, opposite the

city of Troy, and to form a new channel diagonally from the breach to the west side of the river.

The effect of this would probably have been to create an eddy along the shore adjoining the Troy docks in which the light alluvion would be deposited, and in time form a serious obstruction to the navigation.

To obviate this anticipated evil, it appeared to be necessary either to break up and remove a considerable portion of the dam adjoining to the east shore, so as to permit the current to pass down along that shore, or to prevent the formation of a new channel by repairing the breach.

Either of these alternatives would involve considerable difficulty and expense.

A careful examination of all the circumstances connected with this subject, led to the conclusion that it would be best to repair the breach.

On the opening of the canal in the spring, it was perceived that there was a vast increase to the number of boats navigating it since the last year.

So great was this increase, that at the junction of the two canals it was not uncommon to see sixty or seventy at a time, waiting for their turn to pass, although the locks were in constant use night and day.

It was apparent that the trade on the canals would yearly increase, and that the consequent delay and interruption at the junction would soon become a serious inconvenience.

The reparation of the breach would in part obviate this inconvenience, as it would furnish another line of communication to and from Troy and Albany, by which the junction might be avoided.

And although the channel of the river for the purposes of boat navigation is much inferior to the canal,

yet the inconvenience of a delay of ten or twelve hours, which frequently happened last spring at the junction, would often induce boats to use the river.

These considerations among others, induced the canal commissioners to adopt a resolution, under which the repair was undertaken by several responsible individuals upon the following conditions, to wit: that the dam should be completed in the course of the season, at the expense of the contractors, without any payment of money from the state, and that if it should stand firm and secure through the fall, winter and spring floods, and remain entire and uninjured at the subsiding of the water in the spring, the contractors should receive twenty-five thousand seven hundred and fifty dollars; otherwise, nothing.

Under this resolution the dam has been repaired, and as yet exhibits no symptoms of failure; and the manner in which the work was done affords a strong presumption of its permanency.

If the dam is found to be uninjured after the spring floods are over, its durability may be anticipated; for in works of this kind which are new and unsettled, the first exposures to floods are the most hazardous: and if such exposures do not produce mischief, they diminish the probability of future failures by the compactness and solidity which they occasion.

In pursuance of the concurrent resolution of the Senate and Assembly of the of April last, authorising the canal to be made out of, and separate from the river between Fort Edward and Fort Miller; this route has been carefully explored, and maps and estimates of it have been made.

The distance is about eight miles, and the nature of

The ground is as favourable for a canal as had been anticipated.

The construction of this piece of canal would not, however, have the effect of remedying the evil of which those who navigate the Champlain canal complain.

It would still be necessary to use the bed of the river for about two and a half miles from Fort Miller to the south, in which distance it would be difficult, if not impossible, to maintain a towing path without great expense, in consequence of the floods of the river and the character of the soil along the shore, which is mostly composed of a light sandy alluvion, a kind of earth which is very readily displaced by the action of water.

And the navigation would moreover be incommoded by winds and by the current of the river, which in times of freshets is very considerable.

By extending the contemplated canal from Fort Miller about two and a half miles south, and crossing the river on an aqueduct below the Saratoga dam, or by locking into the pond above the dam, and crossing the same on a towing path bridge, the navigation would be very much improved.

The construction of an aqueduct would make the most perfect navigation; but as its piers would probably form an obstruction to the rafting in the river, and its cost very materially exceed that of a towing path bridge, the latter would probably be the most eligible mode of perfecting the navigation from White-Hall to tide water.

If the above mentioned extension of the canal were adopted, the water for supplying it might be entirely drawn from Fort Edward, and the dam across the ri-

ver at the head of Fort Miller falls, which, by raising the water, has created very extensive and formidable claims for damages, might be abandoned by the state, and those claims entirely obviated for the future.

This subject was explained to many members of both branches of the Legislature, at the session in October last, and a resolution designed to authorise the above mentioned extension of the canal, passed the Assembly by a great majority; but owing to the hurry of business, or some other cause, it did not receive the sanction of the Senate.

In the opinion of the canal commissioners, the above extension ought to be made; and it is respectfully recommended to the legislature to authorise the same.

In order to ascertain with accuracy the amount of freight with which the boats navigating the canals are loaded, so as to ensure the collection of the full amount of tolls, and to detect and prevent any frauds upon the revenue, three hydrostatic locks have been constructed; one opposite to the city of Troy, on the junction canal, and the other two on the Erie canal, the one at Utica, and the other at Syracuse. They have already been very useful, and their utility will increase with the augmentation of business on the canals.— Those on the Erie canal are constructed of wood, and the one on the junction canal, of stone masonry of very superior workmanship. The accuracy of this lock was frequently tested with very satisfactory results. Twenty tons, carefully weighed with scales in parcels, and put into a boat, were found to weigh eighteen pounds more in the lock, and this difference of eighteen pounds was probably not more than the loss created by the friction in turning the scales.

These hydrostatic locks are constructed with a

chamber sufficiently large to receive any boat used on the canals. The chamber is on the same level with the canal, and is filled from it by a paddle gate which is fixed in a large gate. On a level below the chamber is a receptacle, into which, by a gate, the chamber can be emptied, and from this through another gate, the water can be discharged. The gates are made as accurate as possible, to prevent leakage; and although they cannot be made perfectly tight, yet if they are equally so, the result will be the same, as the loss at the one will be compensated by the gain at the other.

When it is designed to ascertain the weight of a loaded boat, the chamber is first filled by the opening of the paddle gate, after which the large gate is opened, the boat is moved from the canal into the chamber, and the gates closed behind it. The depth of the water in the chamber is then carefully ascertained by a metallic rod, graduated into feet, tenths and hundredths of a foot, and the cubic contents of the water, with the boat floating in it, is at once obtained from a table constructed for the purpose, and adopted to the graduations of the rod.

Suppose the column of water in the lock in which the boat is afloat, is 85 feet long, 15 feet wide, and 4 feet deep; then by multiplying the length, width and depth of this column into each other, its contents in cubic feet are obtained. Thus, $85 \times 15 \times 4 = 5100$ cubic feet of water, including what is called the flotation bulk of the boat, or in other words, including the contents of the volume of water displaced by the boat. The water is then drawn off into the receptacle, and the boat settles down upon timbers, so arranged as to yield to its shape, by which it is supported,

without being strained or injured. The quantity of water drawn from the lock is then ascertained by the graduated rod. Suppose the water in the receptacle measures 30 feet long, 25 feet wide, and 5 feet deep: these multiplied into each other as before, will produce 3750 cubic feet. It is a principle in hydrostatics, that every body which floats in water, displaces a volume of this fluid, precisely equal in weight to the floating body. It appears from the above, that the water, with the loaded boat floating in it, contained 5100 cubic feet, and that the same water, drawn off and measured separately, contained 3750 cubic feet, which, subtracted from the preceding, will give 1350 cubic feet of water displaced by the loaded boat. And as a cubic foot of fresh water weighs 1000 ounces avoirdupoise, or $62\frac{1}{2}$ pounds, it follows that $1350 \times 62\frac{1}{2} = 84375$ is the weight of the loaded boat. This is to be reduced to tons, and the weight of the empty boat previously ascertained in the same manner, is to be deducted, and the remainder will be the weight of the cargo. After an empty boat has been once weighed she is numbered, and her weight is registered at the several hydrostatic locks.

In the early part of the season the lock at Albany, connecting the canal with the basin, shewed symptoms of failure. It was thought advisable to procure the materials for a new lock, and to construct the same by the side of the failing one, under the impression that two locks would ultimately be useful at this place, and also with a view to prevent any interruption to the navigation. Before the materials for the new lock could be prepared, the old one entirely failed, and it was then perceived that the old one could be taken up and rebuilt sooner than the new one

could be constructed. This course was adopted, and the lock was taken up and relaid with as much expedition as was consistent with the permanency of the work. The materials which had been procured for a new lock were transported to the junction of the two canals, where, in consequence of the great increase of trade, double locks must be constructed the ensuing season.

The work on the feeder above Glen's Falls, has not been prosecuted, because the appropriation made last year would not allow this work to be carried on except at the expense of the more important works on the western section of the Erie canal. The appropriation also, made by the act of the 17th of April, 1822, for the purpose of constructing locks on this feeder, is entirely insufficient, even though they should be constructed of wood; and the policy of constructing works of this kind, of destructive materials, is at least very questionable. The advice and direction of the legislature on this subject, is, therefore, respectfully solicited.

The proper adjustment and payment of claims for damages, frequently involves an intricate examination into titles, and other questions of considerable difficulty. The following among others have occurred, to wit: whether it is proper to pay to the mortgagor or mortgagee, where they both claim the damages; to whom the damages shall be paid which have been awarded on premises sold on execution, and the statutory period of redemption not elapsed; whether a payment to a widow, as the natural guardian of her children, who are infant heirs, is proper.

An act of the legislature, legalising such payments of damages as have been or may be made, either to

the owner or occupant of the premises on which the damages are awarded, would probably prevent future difficulty.

An assessment of damages cannot be judiciously made immediately after the construction of the canal. It is often found necessary after the admission of the water, to make additional excavations in the adjoining grounds in order to strengthen or repair the banks.— The canal in many places passes through porous earth, which leaks and diffuses its water over the contiguous land. If these leaks do not close by the settling of the banks, back drains become necessary. Back drains, however, are not always effectual, because the leakage some times settles perpendicularly through the bottom of the canal to a considerable depth, where finding a water-tight stratum, it passes over the same, ten, fifteen or twenty rods, and sometimes further, before it shews itself at the surface of the earth. It has often happened that leaks which were copious at first, and threatened permanent mischief, have on the second or third year, become perfectly tight, so as not to produce the least injury. The experience of two or three years, is in general indispensable to ascertain the effect of the canal upon lands which are contiguous, and which lie on a lower level; and such lands will be found more than half of the distance of the whole length of line on both canals. To make appraisements prematurely, without this experience, and without a knowledge of all the facts which necessarily enter into a just consideration of the subject, would illy comport with a faithful discharge of the duty enjoined by law. It would be a substitution of uncertainty and conjecture, for that dispensation of justice which is equally due to the state and to individuals.

In all cases where it was necessary to remove buildings, they have been removed and repaired at the expense of the state; or the owner has been paid at the time a reasonable sum for removing and repairing the same; and in nearly all the cases in which damages are now claimed, the claims are predicated upon the alleged value of the land occupied by the canal, the inconveniences sustained during its construction, or the injury occasioned by leakage. The extravagance of some of these claims is only equalled by the pertinacity with which they are urged. That the owners of the lands through which the canals are made, must have been necessarily incommoded in the occupancy of their farms during the time of their construction, is very apparent. And it is also equally apparent that they must have derived very important advantages from the construction of these public works. The creation of a ready market at their doors for all kinds of agricultural productions, and of a demand for all kinds of labor, with liberal prices, must have been the result of the heavy canal expenditures which have been made; and must have conferred peculiar advantages upon the whole country along the line of the canals. In addition to this, the permanent benefit of a cheap and easy access to market by water, must in general have given an increased value to all the lands in the vicinity of these works.

Very extensive back drains have been constructed during the last season, and in most cases the lands which had been injured by leakage have been reclaimed.

Many appraisements have been made, and many more are under consideration; and it is believed that the

greatest part will be disposed of within two or three months from this time.

Boats which move but two, or two and a half miles an hour, do but little injury to the banks; but when the velocity is increased to four miles an hour, as is the case with packets, the accumulation of resistance and consequent disturbance of the water, is very great. This rapid motion of the packet boats creates an artificial wave, by which the banks of the canal in many places are seriously injured. It would perhaps be deemed a public calamity to exclude from the use of the canals such boats as are designed for the conveyance of passengers, or to prohibit them from moving at a rate of more than two and a half miles an hour. But with the present rates of toll (6 cents a mile) they do not indemnify the state for the injury which they occasion; and the toll upon them ought to be considerably augmented. A freight boat with 30 tons of merchandise, navigating 200 miles of the canal, pays \$184, whilst a packet, under the present rates, pays but \$12 for the same distance; and the injury done by the packet is probably one hundred times greater than that which is occasioned by the freight boat.

The tolls collected on the Erie canal the last year, amount to	\$294,546 62
On the Champlain canal,	46,214 45

Total	\$340,761 07
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The following statement from the Collector's Office at West Troy, which is situated below the junction of the canals, exhibits the principal amount of all the articles which have passed on the Erie and Champlain canals.

[See table.]

Amount of Articles passing North and West, on the Canal at West Troy, in 1824.

	Tons. cwt. qrs. lbs.				Boards and Plank, Lath and Shingles,	Feet. T. cwt. qrs. lbs.					
	Tons.	cwt.	qrs.	lbs.		Feet.	T.	cwt.	qrs.		lbs.
Merchandise,	24474	10	2	23		48402	72	15	0	0	Estimated at 1 ton 10 cwt. per 1000 feet.
Nonenumerated,	3321	17	1	23		24	3	15	0	0	
Stone, Clay and Sand.	1121	4	2	27							
	28917	12	3	17	Total,						
						76	10	0	0		
						28917	12	3	17		
						28994	2	3	17		

Amount of Articles passing East, to Troy and Albany, on the Canal at West Troy, in 1824.

ARTICLES.	Quantity.	Tons. cwt. qrs. lbs.				
		Tons.	cwt.	qrs.	lbs.	
Merchandise,		335	17	3	11	
Nonenumerated,		1611	14	0	15	
Cheese, Butter, Lard, and Tallow		1215	11	3	10	
Bush. Coarse Grain,	59404 $\frac{1}{2}$	1325	17	3	12	Estimated at 50 lbs. per bush.
Galls. Whiskey,	361981	1458	17	3	5	do 9 lbs. per gall.
Bush. Wheat,	284720	7626	8	2	8	do 60 lbs per bush.
Bbls. Ashes,	28924	5784	16	0	0	do 5 bbls. per ton.
Bbls. Provisions,	24286	3	69	16	10	do 7 do
Bush. Salt,	78066	1951	13	0	0	do 56 lbs. per bush.
Bbls. Flour,	142552	16330	18	0	16	do 216 lbs. per bbl.
Gypsum,		3892	10	0	0	
Cement and Lime,		1255	0	0	0	
Bbls. Oil,	1125 $\frac{1}{2}$	138	3	3	0	do 2 cwt. 2 qrs. per bbl.
Tierces Seed,	1281	256	4	0	0	do 5 tierces per ton.
Cords Wood,	682 $\frac{1}{2}$	17057	10	0	0	do 2 ton 10 cwt. per cord.
M Staves,	2205	6615	0	0	0	do 3 ton per M.
M Shingles,	6315 $\frac{1}{2}$	947	6	2	0	do 3 cwt. per M.
Cubic feet Timber,	241091	4304	6	2	0	do 40 lbs. per cubic foot.
Feet Boards and Planks,	35256514	52884	15	0	0	do 1 ton 10 cwt per 1000 feet.
		128452	9	0	3	Passing East.
		28994	2	3	17	Passing North and West.
Total,		157446	11	3	20	Passing East, North and West.

The number of boats which have passed on the canal, below the junction, has been equal to an average of 40 per day, through the season; between the junction and Utica, on the Erie canal, 24 per day; and between Utica and Rochester, 16 per day, including packet boats, of which 4 run daily.

It is ascertained that a boat can be passed through a lock in five minutes; and that allowing for all contingencies, one can be passed every eight minutes during the twenty-four hours, making 180 each day.

By doubling the locks, twice this number, to wit: 360 can be passed daily, without much inconvenience at the locks, or elsewhere on the canals, provided they could move in regular order: for allowing them to move in equal numbers each way, and at the rate of $2\frac{1}{2}$ miles an hour, a boat leaving a lock at the time another is entering, will advance 106 rods in eight minutes, and will meet another boat at an average of half that distance, or every 53 rods. Boats, and the horses towing them, might meet at this distance without any material interruption or inconvenience; so that another towing path, if the bridges, aqueducts and other artificial works, and the sliding banks and perpendicular rocky precipices along the Mohawk admitted of its construction, would be wholly unnecessary.— Two boats cannot pass each other upon any of the aqueducts; and the canals being but 40 feet wide on the surface, and 28 at the bottom, and the boats 14 feet wide, only two can pass each other on the canal: so that only one ascending, and one descending line of boats could be used, even if two towing paths were constructed. Besides, it will always be necessary to use one side of the canal as a place of deposit, for articles to be transported, and where boats may lie to

load or unload. When those who navigate the canal find it necessary to stop, in order to feed their horses, to take in or discharge parts of their cargo, to repair their boats, to procure provisions or water, or for any other purpose whatever, they must fasten the boat to one side or the other of the canal, so that it may be out of the way of passing boats: and it is not perceived how this could be done if there were a towing path on each side of the canal.

The great press of business on the eastern section of the Erie canal, particularly in the spring and fall, will before long exclude packet boats from the use of this part of the line, unless double locks are made the whole distance, and even then, the immense crowd of boats at those periods, will produce great inconvenience and delay. There are some places on the eastern section, particularly at the Little Falls, and at Yankee Hill, where it would be almost impossible to construct double locks; and in several others, the expense would be very great. And it is presumed that the experience of two or three years more, will satisfy the public, that it will be proper to commence the construction of another canal parallel with the eastern section. This canal might be connected with the present one, at the east end of the long level, between nine and ten miles east of Utica; from thence it might cross over to the north bank of the Mohawk, and be continued down on the north side of the river to Alexander's Bridge, at the upper aqueduct, nearly four miles below Schenectady, where it might be carried across the river, and continued on the south bank to tide water. The whole of this line has never been carefully examined and levelled, but the general appearance of the country, is nearly as fa-

avorable for a canal as on the opposite sides of the river. And a canal on the north side of the river would, by its southern exposure, always have the advantage of being navigable some days earlier in the spring, and later in the fall, than on the south side; and although that advantage may appear trifling at present, it will shortly be of very great importance. It is found by experience, that the middle and western sections of the canal open eight or ten days earlier in the spring than the eastern section. The natural consequence of this will be, that the western boats, pressing forward, with a view to reach the market as early as possible, and return with merchandise for the interior, will accumulate on the eastern part of the middle section in such numbers, as literally to cover the canal for miles in extent; and will be detained on this part of the line for several days, until the warmth of the atmosphere shall have dissolved the frosts in those parts of the canal to the eastward, which are shaded from the sun by the high banks that rise on the south side of the Mohawk. In the fall also, there will be a very great and growing press of business, which two canals would very much facilitate. If the transportation on the eastern section could be equalized throughout the season, and a double set of locks constructed, another canal would probably not be necessary within fifteen or twenty years: but the vast accumulation of business on the canal, in the spring and fall months, beyond what it is in the summer, will render it proper, and perhaps indispensable, to make a parallel canal on this section within a very few years from this time.

The use of the canals increases yearly, by the addition of new articles of transportation. It is, perhaps,

worthy of notice, that leached ashes have been transported during the last season, from Fort Ann to Long Island, to be used as a manure.

The increasing use of the canals will be perceived by the following statement :

In 1820, the tolls on 94 miles of the Erie canal, were,	\$5,437 34
In 1821, on 94 miles,	23,000 00
In 1822, on 116 miles,	57,160 39
In 1823, on 160 miles,	105,037 35
In 1824, on 280 miles,	294,546 62

The debt which has been incurred in constructing the canals, including what will be required to complete the work and pay the damages, will, at the close of the present year, amount to about \$7,700,000, which will be chargeable with an annual interest of about \$420,000. In reference to the payment of the interest and the extinguishment of the principal of this debt, the following calculation is submitted.

The income of the canal fund during the year 1826, by a very moderate computation, may be estimated as follows :

From duties on salt,	\$145,000
„ steam-boat tax,	5,000
„ duties on sales at auction,	200,000
„ canal tolls,	500,000
	<hr/>
Total,	\$850,000

Considering the probable amount of expenditures in repairs, improvements and superintendence, which will be necessary in 1825, and in 1826, it may be estimated that, for these purposes, there will be required, for each year thereafter, for nine years, the sum of

\$100,000

Add the interest one year,	420,000
	<hr/>
	520,000

Which deducted from the receipt of 1826,
leaves an excess of \$330,000

This yearly excess will be augmented by the avails of the canal fund, but principally from the increasing amount of tolls, at an average of \$75,000 a year, for the next nine years; and will, at the end of that period, raise the annual income to \$1,525,000.

If these yearly balances should be regularly and annually invested in stocks or securities, bearing an interest of five per cent. together with the interest accruing thereon, they would, in ten years, amount to a sum which would exceed the whole of the canal debt; and would, if this debt were then redeemable, extinguish the same, and leave an annual and increasing revenue of \$1,525,000. The above calculation will be exemplified by the following table.

End of the first year, 1827,	\$330,000
Interest,	16,500
Excess,	405,000
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End of 2 years,	\$751,500 00
Interest	37,575 00
Excess,	480,000 00
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End of 3 years,	1,269,075 00
Interest,	63,453 75
Excess,	555,000 00
	<hr/>
End of 4 years,	1,887,528 75
Interest,	94,376 43

Excess,	630,000 00
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End of 5 years,	2,611,905 18
Interest,	130,595 25
Excess,	705,000 00
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End of 6 years,	3,447,500 43
Interest,	172,375 02
Excess,	780,000 00
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End of 7 years,	4,399,875 45
Interest,	219,993 77
Excess,	855,000 00
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End of 8 years,	5,474,869 22
Interest,	273,743 46
Excess,	930,000 00
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End of 9 years,	6,678,612 68
Interest,	333,930 63
Excess,	1,005,000 00
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End of 10 years,	\$8,017,543 31

We are aware that to this calculation it may be objected, that the income from sales at auction cannot be relied on, as measures have been proposed in Congress, the effect of which would be, to prohibit those sales, and annihilate this important source of revenue. Considering the laudable efforts which have been made by this state, to accomplish, with her own resources, one of the greatest works of internal improvement that has ever been constructed in any age or country, and considering too, the favorable effects of this example to other states, in the acceleration of like

improvements, and the great benefits which will result to the Union, from the experience which has been acquired and diffused in the construction of our canals, it ought not to be presumed that the general government will take from us any part of that fund, which is inviolably appropriated to the extinguishment of the canal debt, and which is consecrated to that end, by the constitution of this state.

In the preceding calculation, the receipts of toll have been estimated so much within their probable amount, that it is presumed, that no contingency can take place, which will reduce the aggregate amount of the canal fund, at the end of ten years, below the sum specified.

The revenue from tolls is hereafter destined to a rapid increase.

The country within the influence of the Champlain canal, begins to feel the beneficial effects of this great improvement, and will rapidly augment its population, wealth and resources. The tolls on this canal, the past year, exceed the interest of the amount of its cost, and those tolls will probably be tripled within ten years from this time.

On the completion of the Erie canal, a vast increase of revenue will commence. The immense country contiguous to the great western lakes, is now only in an incipient state of improvement. The boundless forests have hardly begun to recede before the march of human industry.

The population of the United States doubles in 25 years; although many of the old settled parts continue to be nearly stationary. This rapid accession to our numbers is principally created by emigration; by the establishment of towns, and villages, and cities, in

the wilderness: and, after the connection of the canal with lake Erie, no part of the earth can offer stronger invitations to the enterprising emigrant, than the west. A temperate climate, and an uninterrupted chain of water communication to the ocean, on which may be conveyed the productions of distant countries, and of other climes, in return for the surplus growth of a prolific soil, are among its peculiar advantages. An immense tide of population will set to the west, and after overspreading the extensive borders of our inland seas, it will throw back upon our great commercial emporium, and upon our inland cities, a correspondent reflux of wealth and prosperity. The western part of this state, and the regions still farther west, whose supplies and surplus productions will traverse the Erie canal, contain at this time a population which cannot be estimated at less than a million. This population, possessing such peculiar advantages, both by nature and art, will probably double every ten years, for the next thirty years; so that those who witnessed the commencement of the Erie canal, may, at the termination of that period, see the productions and supplies of eight millions of their fellow citizens floating upon its waters.

Of the amount of tolls collected upon the Erie canal the past year, (nearly three hundred thousand dollars) more than nineteen twentieths of the whole has been paid by citizens of this state.

The regions west of Buffalo, have hardly begun to pay their contributions for the use of the canal.— Could it have been connected with lake Erie two years ago, so as to have been navigated to the extent which a knowledge of its utility, and the wants of the great community within its influence, would have required,

the above amount of tolls, as we believe, would have been increased to five hundred thousand dollars. And if there is within the sphere of its operation, a population of one million, whose annual contribution in tolls, on its completion and full fruition, would be half a million of dollars, there is no reason to believe that the augmentation of tolls will not thereafter keep pace with the increase of population. On this supposition, the Erie canal alone, will, at the expiration of ten years, give a revenue of a million of dollars.

Assuming the above to be true, the calculation of the increase of inhabitants within the influence of the Erie canal, and of the tolls to be paid by them, for the next ten years after 1826, will be as follows:

	Inhabitants.	Toll.
1826,	1,000,000	\$500,000
1827,	1,100,000	550,000
1828,	1,200,000	600,000
1829,	1,300,000	650,000
1830,	1,400,000	700,000
1831,	1,500,000	750,000
1832,	1,600,000	800,000
1833,	1,700,000	850,000
1834,	1,800,000	900,000
1835,	1,900,000	950,000
1836,	2,000,000	1,000,000

Pursuing the same mode of calculation for the next ten years after 1836, on the presumption that the tolls will not be reduced after the extinguishment of the debt, and the Erie canal will produce at the end of that period, an annual revenue of \$2,000,000; and in ten years thereafter \$4,000,000.

But it ought to be considered that the great mass of our inhabitants are agriculturists;—that the gen-

eral pacification in Europe, has nearly destroyed our foreign markets, and that not only the revenue which we have already derived from the canals, but the calculations of future increase, are predicated upon more depressed prices of the productions of husbandry, than have been witnessed in many years.

Agriculture, with us, is the great vivifying principle, which like the source of light and heat, imparts life and activity to every surrounding body. When this languishes, every spring of industry is relaxed; and its successful operation, diffuses prosperity into every department of the community. Should any change in the state of foreign markets improve the price of our staple commodities, such alteration will proportionably augment the revenue of the canals.— And the present, or a worse state of the markets abroad cannot, we think, continue for a long period without producing great and beneficial changes at home. The industry of our fellow citizens cannot be permanently repressed. When a barrier is opposed to its course, for a sufficient length of time, it will, like a mighty stream, burst out into a thousand new channels. The farmer, when he can no longer thrive by his occupation, will exchange it for another. A portion of our young men, instead of following the plough, will assume the hammer of the artizan, and the implements of the manufacturer. The raw materials of all kinds, with which our country so amply abounds, will be wrought into the manufactured article. And the great mass of the community, instead of being the mere growers of the productions of the earth, which cannot find a market at home, and only a precarious sale at very reduced prices, in foreign countries, will be di-

vided into different pursuits, reciprocally supporting and mutually dependant upon each other.

An easy intercommunication between distant parts of the country, through our rivers, lakes and canals, and the numerous and valuable water powers, which are every where found, will open new fields for industry and enterprize. The immense wealth which accumulates in our cities, and which is constantly seeking an absorption in stocks, or in mere monied institutions, will be invested in rich manufacturing establishments, diffused through all parts of the country; thereby giving a new impetus to every branch of industry; producing a home market for our agricultural productions, and creating an internal trade which will give an incalculable increase to the revenue of the canals, and to the general prosperity.

But, dismissing every expectation of increased revenue from an improved state of the markets abroad, or a beneficial change in our pursuits at home, the calculations of revenue, which are above submitted, are sufficiently flattering to the pride of this state. Hitherto, our anticipations in reference to the receipt of tolls, have uniformly fallen short of the reality, as will be seen by a reference to our former reports, and to the previous receipts of toll. Nor have we any doubt but that the same fate awaits our present calculation. But it is safer to err on this side, than on the other. It is better to look through the sober medium of the understanding, into the vista of prospective wealth and prosperity which is opening upon the state, than to cast upon it the prismatic colourings of fancy.

With respect to the greatest amount of transportation, of which the Erie canal is capable, it may not be amiss to submit a few observations; because, although

its capacity in this respect, is much greater than is generally believed, yet the time will arrive within the present century, when it will be entirely incapable of satisfying the multiplied demands of a great and increasing community.

The annual period of navigation at present, is about 220 days; but if the same changes of climate are produced in our country (and those changes appear to be rapidly progressing), by the cutting down of the forests, as have been produced in France, Germany, Italy and other countries, by the same process, our annual seasons of navigation will ultimately be extended to 250 or 275 days. Indeed, should our climate assimilate to that of the western parts of the continent of Europe, in like parallels of latitude, the yearly period of navigating the Erie canal, would be yet longer.

During the time that the canals have been in use, the boats navigating them have been gradually increased in size; and nearly all those which have been last built are of the capacity of from 35 to 45 tons; and it is probable that after a few years more, they will, in descending to tide water, generally carry 40 tons.

In the calculation which we are about to submit, it is assumed, that only the eastern half of the canal is to be supplied with such an amount of transportation, as if equally distributed through the season, would require the passage of a boat every eight minutes, through two sets of locks, and on the western half of the canal, every eight minutes through a single set of locks. But the time will arrive within fifty years, when the number of the people of this state, who will use the canal, will form but an inconsiderable fraction of the whole number, whose property will float upon it; and when nine tenths of the pro-

duce and merchandise which is transported upon the canal will pay toll, if it is then chargeable, for the use of the whole length of the line.

It is found that the produce which reaches the Hudson by the canals, amounts to about five times as many tons, as the merchandise, &c. which is sent into the country; and by this ratio, the descending boats carrying 40 tons each, will return with a cargo of 8 tons each.

The above premises will give the following results:

The amount of produce that would reach the	<i>Tons.</i>
Hudson in one season, would be	1,584,000
And of merchandise sent to the west,	316,800
	<hr/>
	1,900,800

The Erie canal being 362 miles long, a toll of $1\frac{1}{2}$ cents per ton, per mile, on produce, and 3 cents per ton, per mile, on merchandise, would produce the following amount:

Toll on produce on western half of canal,	\$2,150,280
On eastern half	4,300,560
Toll on merchandise on western half	860,112
On eastern half,	1,720,224
	<hr/>
Total,	\$9,031,176

From the above it will be seen, that the Erie canal may give a revenue in one year, of nine million thirty-one thousand one hundred and seventy-six dollars.

The regulations which we have adopted, and put in practice upon the canals, for strengthening the banks, preventing and repairing breaches, removing bars and other obstructions, keeping the locks, aqueducts, &c. in constant repair; and for facilitating the

passage of boats through the locks at all times of the night, have produced the most beneficial results: and we think it is not too much to say, that works so new and unsettled, so extensive and various, and exposed to such a variety of accidents by floods and otherwise, were never before so perfectly maintained.

We are satisfied that frauds upon the canal revenue, to a considerable extent, have been practised.— The compensation provided by law for weighing the cargoes of boats, is entirely too small, and ought to be raised. The great press of business at the offices of some of the collectors, and the multiplicity of articles, frequently charged with different rates of toll, have often rendered it impossible to ascertain, with exactness, the amount which ought to be paid. Where boats are closely stowed and deeply laden, it requires considerable time and labor, to determine the character and weight of the cargoes; and it is ascertained that some of those who navigate the canals, have several times given false accounts of their loading. By the aid, however, of the hydrostatic locks, which will hereafter be in use, and a vigilant system of inspecting the boats, whilst they are receiving and discharging their cargoes, together with other checks, we trust that we shall, in future, be able to detect and prosecute every attempt at fraud, and to enforce a full collection of tolls.

STEPHEN VAN RENSSSELEAR.
SAMUEL YOUNG,
HENRY SEYMOUR,
WILLIAM C. BOUCK.

Albany, 4th March, 1825.



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