the supposition that *whether from chemical constitution or from mechanical treatment, a deficiency in specific gravity is an indication of inferiority* in the strength of iron. I am aware of some apparent exceptions to this rule.

In conclusion it may be observed that the great amount of much worse iron which finds its way into the American market, will render even the McIntyre iron No. 2, an object worthy the attention of the consumers of this article. But as a large and an increasing demand for good iron prevails in the United States, in proportion to the increase of finished and accurate machinery requiring superior materials as well as workmanship, there can be no doubt that any quantity which could probably be produced, if possessing the properties of No. 1, would command a ready market and the best of prices.

Civil Engineering.

Some remarks on the Internal Improvement System of the South, by JOHN C. TRAUTWINE, Engineer in Chief of the Hiwassee R. R.

WITH A MAP.

For some time after the introduction of rail-roads into our Union, their construction was confined almost exclusively to the northern states. To Pennsylvania is due the credit of having been foremost in the cause of state rail-roads, as she had before been in that of state canals. She has, through either her Legislature, or chartered companies, expended the heavy sum of thirty millions of dollars, in works more or less intimately connected with internal improvements. Large expenditures had also been made in Maryland, Delaware, New Jersey, New York, the New England states, and Virginia, for a considerable time before the importance of the internal improvement system appeared to manifest itself to the more southern portion of the Union; and with, I believe, the single exception of the South Carolina rail-road in 1830, but little or nothing of importance had been done to further its advancement, until within the last 3 or 4 years.

The river Ohio (see accompanying map) in connexion with the improvements of New York and Pennsylvania, has hitherto been the great thoroughfare along which merchants of the west and interior have sought the markets of New York, Philadelphia, Baltimore, and other northern Atlantic cities; and along which they have in return transported to their several states, the goods purchased in those cities. South of the Ohio, they have never had offered inducements to visit the southern ports. Five or six hundred miles of miserable roads, nearly impassible in winter, have effectually shut out all intercourse between the merchants of the west and the Atlantic seaports of the south. The only rival of the northern cities in the trade of the north western states, and of the interior, has been New Orleans; to which an easy access is had down the Mississippi river. But even there the trade has been confined principally to groceries, of which the sugar and molasses manufactured near New Orleans, constitute the principal items. As respects merchandise, the sales there are principally made to retailers, living along the banks of the river, who send down produce to New Orleans, and receive return loads of groceries and merchandise in exchange. The *wholesale* merchants even along the Mississippi river, and of the states of Mississippi, Alabama, Georgia and Tennessee, as well as those of the north western states, make their purchases in the northern cities; which in the sale of all articles of European manufacture, enjoy almost an exclusive monopoly.

This is owing in a great measure to the superiority of the navigation between them and Europe, over that between New Orleans and Europe. Not only is the voyage to New Orleans the longer by more than 1000 miles, but it is rendered comparatively dangerous by the intricate passages, and obstructed navigation of the Bahama banks and capes of Florida.*

This objection, however, does not apply to the cities of the southern Atlantic sea board. The navigation from Europe to Charleston and Savannah, is at least as good, if not better, than that to the northern cities. Moreover the south would have a very important advantage over the north, in the mildness of her climate, which would allow merchants to transport their goods at all seasons, without fear of obstruction from ice. Serious delays occur annually in the northern canals, from this cause. Let the south then open for the merchants of the west and interior, as good avenues to her seaports, as the cities of the north have done to theirs, and the monopoly of the latter must at once cease, and the south become a heavy importer. This she has finally resolved to do.

Within the last few years, the confidence which had been awakened in the south, by the increasing number of our northern projects, gradually became stronger; and as the success of these projects by degrees revealed itself in the realization of handsome profits, finally was confirmed. Thus experimentally convinced of the immense benefits resulting to the Atlantic cities of the north, from their numerous channels of intercourse with the west, she determined that she also would enjoy them.

This determination was promptly followed up by suggestions for various lines of rail-road, stretching from the principal Atlantic cities of the south, to the interior of our Union; where their upper extremities are to be united to the lower termini of other lines, now being constructed in the north western states of Indiana, Illinois, and Ohio, by which they will be extended even to the great lakes.

Through these connected lines of rail-roads, the merchants of the west will have as easy access to the seaports of the south, as to those of the north. The former will thus be enabled to effect an extensive importing system, and the heavy trade now monopolized by the north, will be distributed more equally along our entire sea board.

A strong impulse has been given to the southern improvements by the lively interest taken in many of them, by the several states through which they pass; the consequence of which judicious policy is, that almost every individual state south of the Potomac and west of Pennsylvania, is at this moment engaged in forming its respective link in the grandest chain of internal improvements ever suggested; and one which will in less than six years from this time, effect an almost magical change in the commercial relations of the various sections of our country.

Fortunately for the south, she has conducted her operations thus far, with a spirit of unity and concert, much more marked than that which characterized the northern projects. Her several districts, sensible that the prosperity of each depended on its means of ready intercourse with all the others, are

* Might not this difficulty be remedied in some measure, by the construction of a ship canal across the Isthmus of east Florida? Its length would probably not exceed 80 miles, and the country is very favourable for its construction. That common objection to canals, viz. their liability to obstruction by ice, would not apply here, owing to the mildness of the climate; the voyage would be greatly shortened and the most difficult and dangerous portion of it entirely avoided. This is one of the few instances in which we consider a canal *infinitely* preferable to a rail-road.

constructing their respective lines with a view not only to the effecting of *local* considerations, but to the accomplishment of a magnificent project of *National* importance.

✓The most striking feature in the commercial aspect of the south, is her *Cotton growing*. The cotton country includes South Carolina, Georgia, Alabama, Mississippi, middle and west Tennessee, and large tracts west of the Mississippi river. The great demand for this article over the whole globe, renders its cultivation far more profitable to the southern landholders, than that of the common agricultural products would be. Consequently the cotton country is devoted almost exclusively to its culture; a small proportion of rice constituting nearly the only exception. The cotton is pressed and put into bales at the place where it is grown; and thence sent by land to the nearest navigable stream, down which it is transported, principally in steam boats, to the various southern ports.

The business of most of the flourishing towns of the south, depends very essentially upon the receiving and exporting of cotton; all other things remaining as at present, many of them would probably cease to exist, with the demand for that article.

It follows from this general neglect of the farming interest, that the southern population must depend upon other sections for supplying them with provisions. These they receive from the interior and north western states; but especially from Kentucky and east Tennessee, both of which districts, in point not only of agricultural, but of mineral and manufacturing resources and facilities, are excelled by no other portions of the Union.

From them, immense droves of live stock, and heavy amounts of provisions are annually sent to the cotton country, where the great distance and the wretched condition of the roads cause them to sell very high. On this account provisions command greater prices in the southern sea ports than in any other part of the United States; and as the badness of the roads and the great length of hauling necessary, will not admit of an exchange for merchandise, the sales are almost always for *cash*; of which large sums are thus annually transferred from the south to the interior and north western states. When the southern rail-roads shall be completed, this draining of cash from the cotton country, will in a great measure be counteracted by the sales of merchandize to the western merchants.

As before remarked, the universal demand for the staple product of the south, enables the southern seaports to do an immense *exporting* business. The raw cotton is from them shipped principally to Liverpool; and in England, that great manufacturing district for the whole globe, it is made up into goods, and in that state sent to every quarter of the earth.

A great quantity returns to this country; but not as one might at first suppose, to the *southern* sea ports, from which the raw material was exported; it returns to the sea ports of the *north*; because there the merchants of our immense interior congregate to make their purchases; and thus ensure a constant market.

But *why*, it will be asked, do the merchants of the interior prefer the sea ports of the north, to those of the south? The answer is simply this, *because the roads are better*. The cities of the north have by a judicious system of internal improvements, opened for the western merchant, easy routes to reach their markets; and safe and speedy ones for carrying his purchases home. While Baltimore, Philadelphia, and New York have been contending with each other, for the supremacy, by each trying to excel the other in her channels of intercourse with the west, the south has stood idly by

and done nothing. She has been content to permit not only the merchants of the interior, but even *her own, those residing in her own sea ports*, to purchase their goods in the northern cities.

She forgot that the opening of every fresh avenue to the *north*, was the obstructing of one to *her*; and heartily joined in congratulations at the increasing prosperity of her sister, unmindful that it was secured at her own expense. "Better late than never," is a good old saying; and upon its inculcations has the south at last begun to act. She has commenced, and is now energetically pushing forward, a system of rail-road improvements, which will soon present to the merchant of the interior, inducements to visit her sea ports, as well as those of the north; and by purchasing his goods there, enable her to open a direct *importing*, as well as *exporting* trade, with the other continent.

But even with the manifold benefits which must result to Charleston and Savannah, from the completion of their rail-roads to the interior, we can not, with many of our southern friends, look for those cities ever to attain the size and commercial importance of New York or Philadelphia. From the very nature of the staple (cotton), which requires comparatively few landholders, it appears to us impossible that the population of the south can ever become so dense as that of the north; and the magnitude of a market, must depend upon the number of purchasers. A large cotton grower can easily cultivate 1500 acres; while our wealthy northern farmers, rarely hold more than 500; and perhaps the majority do not exceed 250. Besides this, the inexhaustible mineral resources, the manufacturing and agricultural advantages, the more equal distribution of wealth, and I may add, the more stirring and industrious business habits incident upon the colder climate of the north, all combine to render her cities more affluent than those of the south.

Still shall the south have attained that great desideratum, a termination of her mercantile dependence on the north. Her rail-roads will enable the merchant of the interior to purchase his goods alike in New York, Philadelphia, Charleston or Savannah, as either may, from fluctuating causes, offer the best market. Instead of the heavy cash purchases of stock and provisions now necessary, an exchange of these articles for merchandise will be effected, and Savannah and Charleston will in a few years have attained an importance, with which their present condition will admit of no comparison.

But shall we permit the foreboding politician to predict from this termination of commercial dependence, a cessation of national dependence, of national feeling? Far from it. Community of intercourse will annihilate our local prejudices, will bury in oblivion the differences of by-gone times, and draw the bonds of union more close than ever.

We will now pass on to the consideration of the several lines of rail-road by which the south hopes to accomplish the grand object in which she has embarked.

A reference to the map will show that Illinois, Indiana, and Ohio are constructing several rail-roads from their respective interiors, to the Ohio river; it will show, moreover, that they are constructing some of them in such directions, that, by uniting, they will form *a continuous and very direct line of rail-road from the "Far West," passing through Cincinnati to the NORTHERN SEA PORTS;—and thirdly, it will show that from Cincinnati to Philadelphia by this line of rail-road, is a shorter distance than from*

Cincinnati to Charleston, by way of the Charleston and Cincinnati rail-road.

We wish these facts to be distinctly borne in mind by the reader, as we shall soon have occasion to bring them forward in support of some opinions of ours, which are opposed to those of many persons in the south, and therefore require strong arguments to sustain them.

First in importance, magnitude, and splendour of conception, of the several projects for benefiting the south by the effecting of an importing system, is the great Charleston and Cincinnati rail-road. Commencing (see map) at Charleston, this road occupies the line of the old South Carolina rail-road, as far as Branchville, 62 miles, thence it continues to Columbia, a further distance of 66 miles; thence to the North Carolina line, by a route not yet finally determined on, about 150 miles more; thence to Ashville, N. C., 41 miles; thence to the Warm Springs, 36 miles; thence along the valley of the French Broad River to Knoxville, 100 miles; (or 455 miles from Charleston to Knoxville); from Knoxville it passes on through Lexington to Cincinnati by a route not yet finally adopted, about 265 miles; in all about 720 miles.

The company for constructing this road, is chartered by the four states through which it passes; viz. South and North Carolina, Tennessee, and Kentucky. Three of them, viz. North and South Carolina and Tennessee, have also granted banking privileges; Kentucky has not yet, but probably will do so this winter. South Carolina and Tennessee have also rendered pecuniary assistance to the road; North Carolina and Kentucky have not.

Independently of the tendency of this project, considered merely as a rail-road, great and beneficial results are to be hoped for, from its *banking powers*. The late derangement of the money market, has plainly pointed out the necessity for a circulating medium, based on other than restricted local credit; and such a medium the Charleston and Cincinnati Company will certainly effect, *in case the rail-road be completed*.

But if this be not done, we cannot see how the interest of the states through which it is to pass, can be enlisted in its cause; the circumstance alone of its *being chartered* by four states, cannot, it appears to us, prevent it from dwindling down into a mere South Carolina bank, with an influence and credit far less extensive than those of the present United States Bank, of Pennsylvania. To prevent this it will be necessary for Tennessee and Kentucky to lend themselves freely to the work. What has already been done is too trifling, in comparison with the magnitude of the project, to deserve a moment's consideration; it is for all practical purposes only *nominal*. We hope soon to see those two states awakened to a due appreciation of the utility of the undertaking, and embark largely in it.

It will be seen on the map, that *from the city of Knoxville in Tennessee, there are laid down two continuous lines of rail-road to Charleston, S. C.* one of these may be called the *northern or upper route*, and the other the *southern or lower route*. The upper one is that selected by the Charleston and Cincinnati Rail-road and Banking Company; its length (as just now shown) from Knoxville to Charleston is 455 miles. The lower route consists of a chain of several distinct rail-roads, commencing with the *Hivasssee Rail-road*, 98½ miles in length, which extends from Knoxville to the dividing line of Tennessee and Georgia; where it unites with the *Western and Atlantic Rail-road*, which continues 118 miles, to near Decatur in Georgia; thence the line runs to near Crawfordville 58 miles; thence by the Georgia Rail-road to Augusta, 65 miles, thence by way of the South Carolina Rail-road

to Charleston, 136 miles, in all 475½ miles. From Crawfordville to Charleston 201 miles is already completed and in full operation; and between Crawfordville and Knoxville the line is now being graded with great energy. These two lines (the upper and lower) differ very materially in their characters, the upper route being the shorter by 20½ miles; but the lower possessing so great a superiority in point of levels and curves, as will, by admitting of greater speed, enable the trip to be made on it in less time than it can on the upper route.

The lower route affords the entirely unprecedented fact of a continuous chain of rail-road, nearly 500 miles in length, carried principally through a mountainous country, yet nowhere presenting a grade exceeding 36 feet to a mile; and at the same time unincumbered by tunnels or inclined planes.* Its shortest radius of curvature is 1000 feet; and even *it*, if we mistake not, occurs only on the Western and Atlantic Rail-road; on the Hiwassee Rail-road the minimum radius is 1400 feet, and occurs but twice; both being at the crossing of heavy ridges, and at the same time stopping places; on the other sections of the lower route, there is no radius under 1900 feet.

Even the minimum radius of 1000 feet, will with proper attention to details, admit of a speed of 20 miles per hour, with perfect safety; and this may, without fear of error, be assumed as the *least average speed* of the passenger trains, on the lower route; one of from 25 to 30 miles an hour, could readily be attained if necessary.

Each section of the lower route also presents nearly the same maximum grade, varying in none more than 3 or 4 feet; the maximum rise, as before remarked, being but 36 feet in a mile. This uniformity will admit of extreme regularity in the business operations of the several sections.

The wonderfully favourable character of the lower route is incident on the fact, that it occupies a series of vallies, running parallel to the immense mountain barriers, which nature has stretched as if in defiance of the efforts of art, almost uninterruptedly, from New York to the northern parts of Georgia. At the latter point we are enabled to curve round their lower extremities, and thus reach the sea board without crossing them.

On the other hand, the upper route is necessarily carried *across* these barriers, and must therefore encounter the heavy grades incident upon approaching them, and either the deep cutting, inclined planes, or tunnels, required for overcoming their summits.

Again, certain portions of the upper route, such as the deep valley of the French Broad River, and various mountain passes of the Blue ridge; are annually obstructed for several weeks by snow, ice and frost. This will create serious, if not *insurmountable*, obstacles to regularity in the winter business; especially as the thinly scattered population of those parts, will not admit of the collecting of large forces of men to clear the road, as is frequently found necessary in the north.

On the lower route, ice and snow rarely occur at all; and *never* in sufficient quantity to cause a moment's interruption to rail-road traveling.

Again, the cost of the lower route will be so small in comparison with that

* There is, it is true, one inclined plane on the South Carolina Rail-road, a few miles from Augusta; it was incurred when that road was first constructed, to gratify the inhabitants of the little town of Aiken. The extension of the road, as now taking place, was not, at that time, thought of; and as the business incident on the extension gradually increases, the plane will no doubt be dispensed with. Fortunately this can be very readily done.

of the upper, that it will be absolutely impossible for the latter to maintain a competition with it. Thus we see that in point of all the desiderata of rail-road traveling, in speed, safety, certainty, and cheapness, the lower route is, by far, preferable to that selected by the Charleston and Cincinnati Rail-road Company.

I have been thus particular in comparing the upper and lower routes from Knoxville to Charleston, that I might with the more apparent reason, urge upon the advocates of the Charleston and Cincinnati Rail-road, the *immediate* construction of that portion of their road which lies *between Knoxville and Cincinnati*. The present intention of the company appears to be to construct the road gradually from Charleston upwards towards Knoxville, and thus on to Cincinnati; leaving, of course, the part between Knoxville and Cincinnati, some years behind the portion through South Carolina. Now it is very evident that a rail-road from Charleston, through the centre of South Carolina, even if it stop at the northern line of the state, will be of immense benefit to South Carolina, and particularly to Charleston; it will furnish an excellent communication between the interior of the state and her sea board; and this is very important to *her*; but is it important to the *stockholders*? Is it calculated to excite in Tennessee, Kentucky and the whole Union, the confidence which a rail-road from Charleston to Cincinnati was designed to effect? Why should a merchant, residing at a distance from the line, prefer a note of the South Carolina Rail-road bank, to that of any other rail-road; and into a mere South Carolina Bank must the whole scheme degenerate (at least for several years,) if the present intention be persisted in. And pray of what benefit is a line from Charleston to Knoxville to be at any rate, toward effecting an importing system, even supposing both the upper and lower routes to be completed thus far? Let us imagine for a moment that such were the case, and that the interval between Knoxville and Cincinnati remain as at present, traversed only by miserable common roads; can any man suppose that either route, or even their combined attractions, would operate to the value of one farthing, in diverting the trade of the "Great West" from along the Ohio river to the northern sea ports, and turning it towards Charleston? Can he suppose that one merchant more would come from Illinois, Indiana, or Ohio, in consequence of it? Assuredly not. What is to induce the western merchant to exchange the splendid and cheap accommodations, the speed and comfort of his steamboat as he passes up the Ohio, for a rough, unsafe and expensive stage ride of some 200 or 300 miles by day and night, at $2\frac{1}{2}$ miles per hour to Knoxville? Is it the love of adventure, in risking his life over the perilous mountain passes of Kentucky and Tennessee? I trust not, yet can I conjure up no better reason.

I hesitate not to predict that if the Charleston and Cincinnati Railroad Co. delay the construction of their road from Knoxville to Cincinnati, until after the completion of the remainder, the trade of the Great West will have become so fixed in its channel of the Ohio, and the line of rail-roads before alluded to, parallel to that river, that the South will endeavour in vain to change it. Let her even *do her best*, the lines through Indiana, Illinois, Ohio, Pennsylvania and New York, will be completed before she can make the road from *Knoxville to Cincinnati*. What madness is it then to delay. While we are hesitating and discussing whether the upper or lower route from Knoxville to Charleston, be the better, we seem to forget that we have provided no means for bringing passengers and merchandize to Knoxville;

and while, like the wolf and the bear, we are disputing for the prey which lies before us, a third party steps in and carries it away from both.

The course pursued in this matter by South Carolina, upon whose movements the whole machinery of the scheme depends, is by some ascribed (it appears to us uncharitably) to an existing jealousy between her and Georgia; by which South Carolina is supposed to be actuated to such an extent, as to decline all interference in any project in which Georgia should take part; and consequently prefer making an expensive road through her own territory, to availing herself of one of far superior character, through her rival State. Thus we see the upper end of the Charleston and Hamburg railroad, and the lower end of the Athens and Augusta railroad, like the two ends of a horse-shoe magnet, (see map) exercising a repulsive influence on each other, which bids fair to neutralize the otherwise general and beneficial action of this noble scheme.

To us it appears that the policy for South Carolina would be to enter into an amicable arrangement with the various companies constituting the lower route from Knoxville to Charleston, (of which route she already possesses 136 miles, in the Charleston and Hamburg rail-road;) and then construct the line from Knoxville to Cincinnati. By concentrating all her energies upon this interval, she would beyond all doubt, enlist both Tennessee and Kentucky deeply in the enterprise; for to both of those States, it is one of great importance; but so long as the present policy of working from Charleston upwards through South Carolina, is adhered to, the benefits of the undertaking are far too prospective, to induce any active interference in its behalf, on their part.

To adopt the course we propose, would probably lose to the company the charter of North Carolina; as the line would, in that case, not enter her territory. But of what importance is that consideration? Of what benefit is the Charleston and Cincinnati rail-road to be to North Carolina, in any event? It passes only through one of her counties, and that her extreme western one, and of a most sterile and mountainous character. Surely that is not sufficient to induce a hope that North Carolina will render any important aid to the project; whereas in the other case, as before said, both Tennessee and Kentucky would assuredly assist it to a very efficient degree; for both these States would need it for the exportation of their live-stock and provisions to the cotton country; and that alone, independently of any considerations of a southern importing system, should be a sufficient guarantee of profit, to warrant the immediate construction of the road through those two States.

We cannot anticipate much difficulty in procuring from the Legislatures of Tennessee and Kentucky, permission so to alter the charter, as to admit of the changes we propose. Legislative bodies, like private individuals, are influenced by *interest*; convince them that their present course is detrimental to their interest, and they will assuredly change it.

Perhaps the greatest real difficulty in way of the change lies in the company itself, not being willing to have its concerns divided into two branches, as would be the case if our ideas of uniting the Charleston and Cincinnati rail-road with the *lower route*, should be carried into effect. The Charleston and Cincinnati rail-road Company would then own only the road already constructed from Charleston to Augusta, and that, yet to be commenced, from Knoxville to Cincinnati; the interval between Augusta and Knoxville being in possession, as already stated, of several distinct companies.

Could the Charleston and Cincinnati company purchase this interval from

the various companies now holding it, the difficulty would be at once removed; but we consider such an arrangement so utterly impracticable, that it is useless even to suggest it.

Great as the objection certainly is, to the division of the concerns of the Company, still it is obviously not an insuperable one. The case seems to us, nearly parallel to that of a merchant possessing flourishing business houses in two different cities.

Be that as it may, however, we cannot view the construction of the upper route from Knoxville to Charleston in any other light than that of a useless expenditure of money, unless it be looked upon as politic to purchase the good will of the districts through which it passes, by circulating among them at the expense of the company, the sums requisite for its construction. Even if finished, *it can never sustain a competition against the superior merits of the lower route.*

We are somewhat surprised at the course pursued by Kentucky in relation to the Charleston and Cincinnati rail-road. She has lent no pecuniary aid to its construction, although she must necessarily derive great advantages from it. Her merchants will be provided with new markets for making their purchases; and the facilities for conducting her heavy exports will be greatly increased. The road will certainly not be made through Kentucky, unassisted by her pecuniary means; it is therefore to be hoped, not only on *her* account, but in a *national* point of view, that her opinions on the subject may assume a more favourable direction. We cannot but suppose that the adoption of the lower route, would lead to such a change, and enlist Kentucky strongly in the cause.

We have hitherto spoken principally of *Charleston*, as striving to carry out measures for diverting part of the trade of the west, from the northern to the southern sea ports, by means of her rail-roads; we must now speak of her enterprising and spirited rival, Savannah. In point of magnitude Charleston is greatly superior to Savannah, containing a population of 43,000; while that of Savannah is but 10,000. The principal distinctive feature however between the two cities, as regards their importing facilities, consists in the superior harbour of Charleston; which is, we believe, confessedly the best along the Southern Atlantic sea-board.

There will however be no means left unresorted to, for rendering that of Savannah, in every respect perfectly eligible, and this its natural position admits of the more readily, since constructions in that branch of engineering are no longer involved in the uncertainty, by which, until the discoveries of late years, they were characterized.

It will be perceived by the map, that Savannah is determined to be by no means behind Charleston, in her facilities of intercourse with the interior and north western States; indeed if Charleston persevere in her scheme of the upper route from Knoxville, and insist upon conducting her transportation along it, Savannah will have the advantage of a far superior road; which, in our opinion, will much more than counterbalance any disparity which may exist between their respective harbours.

On the map is marked a rail-road from Savannah to the city of Macon, near the centre of Georgia. This is the great *central rail-road of Georgia*; its length is about 200 miles. It is exclusively a company work. About 80 miles of it are already finished and in use; and the remainder is being rapidly progressed with. Like the lower route from Knoxville to Charleston, it is characterised by its unusually favourable features; and indeed the same remark may be applied to all the rail-roads in Georgia.

From the city of Macon the rail-road is continued to the town of Forsyth, by the Monroe rail-road, twenty-four miles in length; which will soon be (if it is not already) in operation.

From the city of Macon, is also to be constructed another rail-road to the town of Talbotton; at which point it will branch off into two lines: one to West Point, to meet the Montgomery and West Point rail-road; and the other to Columbus. Another branch from the Central rail-road is also being surveyed, through the town of Waynesborough to Augusta, by which a union will be effected with the lower route from Knoxville. It will be forty-eight miles in length. Thus it will be seen that Savannah possesses quite as favourable avenues to the interior, as Charleston does; and if a bridge be not built across the Savannah river at Augusta, by which the South Carolina rail-road may unite with the lower route from Knoxville, Savannah must receive the preference from western merchants. We are fully convinced that the want of a bridge at Augusta, and the selection of the upper route, by the Charleston and Cincinnati rail-road company, will do more to decide the question of superiority between those two rival cities, than any other consideration possibly can.

About 70 miles south of Savannah is the sea-port of Brunswick; at present a place of comparatively little importance; but destined, on account of its remarkably fine harbour, and its contemplated rail-road connexion with Savannah, to become in a short time one of the most important of the southern ports.

Besides these Atlantic ports, others on the gulf of Mexico, such as Appalachicola, Pensacola and Mobile will become termini of rail-roads from the interior; and will all be more or less similarly affected with Charleston, Savannah and Brunswick; with, however, this great difference, that the dangerous navigation of the Bahama banks at the mouth of the gulf of Mexico, which must be encountered in a voyage to, or from, Europe, will always keep them secondary to the Atlantic ports. As before remarked, we think this might be obviated by a ship canal across East Florida; or, more imperfectly, by a rail-road.

Appalachicola is at the mouth of the Appalachicola river, formed by the confluence of the Flint and Chattahoochie. The latter is navigable for steam-boats for 200 miles as far as Columbus; from which point, as indicated by the map, are lines of rail-roads to Cincinnati by way of Knoxville; and also to Savannah and Charleston. At this time, Appalachicola is but a small town; it receives considerable amount of cotton from the upper parts of Georgia, by way of the river, but its importance will be increased greatly by its rail-road connexions.

Similarly conditioned with Appalachicola, are Pensacola and Mobile. We have not in our possession, any very definite information respecting the rail-road from Pensacola to Montgomery; we believe however that some progress has been made in its construction. From Montgomery, or rather from Fort Mitchell, (a point some distance above Montgomery) to West Point, is a rail-road in a state of rapid progress. The reason for delaying the construction between Fort Mitchell and Montgomery is, that the river navigation between those places, although very circuitous, is sufficiently good for present purposes. The prolongation to Montgomery, will be made, as soon as the progress of the Pensacola rail-road, renders it advisable.

Through West Point passes also the Columbus and Chattahoochie rail-road, leading from Columbus, to the western and Atlantic rail-road, near

Decatur. This latter road will, like the Montgomery and West Point rail-road, be rapidly pushed forward to completion.

The intercourse of Mobile with the interior, will be both through the same channel as that to Pensacola, and also through the *Selma and Tennessee rail-road*, now under construction from the town of Selma to the Tennessee river, above Huntsville. This road is 170 miles in length. A branch is contemplated from near its upper terminus, along the valley of the Coosa river, to join the western and Atlantic rail-road, near New Echota. This branch will open to Alabama a communication to East Tennessee, by way of the Hiwassee rail-road, to Knoxville; and thence by way of the Charleston and Cincinnati rail-road to the Ohio; it is very important to all Alabama. We have heard of no contemplated branch from the Selma and Tennessee rail-road to Tuscaloosa; but such a one will assuredly soon urge itself upon the public notice, in that section. The harbour of Mobile bay at the town being too shallow for large ships, and gradually becoming worse, it has been found necessary to construct a rail-road 28 miles in length to Cedar Point on the gulf, where the largest vessels lie in safety.

From the town of Wetumpka, above Montgomery, a rail-road is in progress, along the Valley of the Coosa to Fort Williams; by which the obstructions in the river between those points, will be avoided. It is called the Coosa and Wetumpka rail-road; and will be extended to unite with the Selma and Tennessee rail-road, and with the lower route from Knoxville to Savannah and Charleston.

All these roads are constructed with the triple intention of expediting the carrying of cotton from the interior, to the several ports at which they terminate; of procuring provisions more readily from the agricultural districts of Tennessee and Kentucky, &c. and of effecting an *importing system in the South*. The rivers of the South, answer the purposes of intercommunication in but a very imperfect manner. In the summer they generally become unnavigable, for want of water. It is well known that the Ohio trade is interrupted more or less every summer, from this cause; but in the streams still further South, the deficiency is felt to a much more serious extent. Thus the Tennessee river, *even in the most favourable seasons* is rarely navigable for steam-boats, even of moderate draft, for more than two or three months in the year, as far up as Knoxville; and we have known intervals of very nearly a year to elapse, without a sufficient rise of water, for a single arrival. Pretty much the same, only not to so great a degree, may be stated of the river Cumberland, and the city of Nashville. The delays thus occasioned are extremely vexatious, and frequently productive of great inconvenience to the merchant.

We will remark while speaking of Nashville, that we expect soon to see her interesting herself in the construction of a rail-road, to meet the Western and Atlantic rail-road near Ross' landing on the Tennessee river. The Western and Atlantic rail-road, it will be seen by the map, branches into two lines, near its northern terminus; one going directly north, to meet the Hiwassee rail-road; and the other passing in a north-west direction, to the Tennessee river, near Ross' landing. A communication between the latter branch and Nashville, would relieve that city from the embarrassments of the obstructed navigation of the Cumberland. Such a road, in connexion with the Hiwassee rail road, would constitute the best route between Nashville and Knoxville; it would be but a very few miles longer than the present stage road between those places. Its length would be about 100 miles.

Again, in order fully to perfect the importing system of the South, a ready communication is obviously necessary between her sea-board and the region west of the Mississippi river; as well as with the north-western States. Such a communication is in progress. It is marked on the map, extending from the upper terminus of the Selma and Tennessee rail-road, to Memphis on the Mississippi. Of this very important line, the portion between Decatur and Tusculum (43 miles) has long been in operation; and that from Lagrange to Memphis, constituting the Memphis rail-road, 50 miles in length, is in progress. The intervening spaces have not yet been commenced; but undoubtedly soon will be. It will be one of the most useful and lucrative lines in the Union. We look for much more of the Illinois trade with the Southern Atlantic ports to take this channel.

Before closing this paper, we cannot refrain from making a few remarks respecting Virginia and East Tennessee.

It is a common observation, that Virginia is behindhand in her internal improvements, and that she is not equalling her sister States in energy, and foresight. For ourselves we cannot subscribe to that opinion; the remark appears to us an unjust one. Virginia has already done much, and is still steadily progressing in a very extensive and costly system of improvements. To enumerate them would be foreign from our present purpose; we will only urge upon her the necessity of one more. We allude to a rail-road from either Winchester, or Richmond, passing through the State in a south western direction, through Wythe Court-house and Abington, to meet an extension of the Hiwassee rail-road, at the Tennessee line near Blountville. This will form part of the *shortest and most eligible route from Maine to New Orleans, that can be obtained in the Union.*

Surveys have been made for the line from Richmond, and were favourably reported on; but unfortunately the requisite appropriations were not made for prosecuting the work. There can, however, be little doubt that the efforts which will be renewed at this session of the Legislature, will be successful. We consider the question one of immense interest to Virginia. Her fertile and far famed valley has long been retrograding, for want of an outlet to markets, which would permit it to enter into competition with more successful candidates.

This portion of Virginia has depended very much for sales of produce, upon travellers, and upon the wagoners who haul into the interior the merchandize purchased in the northern cities. The traveling has gradually been diverted into other, and better, channels; and even the hauling of merchandize, is at the moment we are writing, about to give way to more expeditious and economical channels opened by the rail-roads, constituting part of the lower route from Knoxville to Charleston; and which is now finished from Charleston northwards, upwards of 200 miles. By this route goods may be shipped from the northern cities to Charleston, and thence forwarded by rail-roads and wagons to East Tennessee, at a less expense than they can be hauled far across the valley of Virginia. No further reasoning is necessary, (though much more could be adduced) to convince Virginia of the necessity of prompt measures in relation to this road. Tennessee will readily co-operate with her, by filling up the interval between Knoxville and Blountville; and thus open an *uninterrupted line of rail-road from Maine to New Orleans.*

In East Tennessee, the reader will perceive that the Hiwassee rail-road occupies a position peculiar to itself, and one of the utmost importance to all interested in it; viz. it is at the same time a portion of the great line

from the N. E. to the S. W.; and of that from the S. E. to the N. W.; in other words, it is the *great cross road of the union*.

The numerous mountain ranges which occupy the region extending for 200 miles on each side of it, forbid the construction of a rival road; and ensure to the Hiwassee rail-road two sources of income, either of which would alone be sufficient to warrant its construction.

This is the case, we believe, with no other rail-road in the country; and it offers to the stockholders, the best inducements to believe in the full success of their project.

We must now call the attention of capitalists and farmers, to the eastern section of Tennessee. We are certain we are within bounds, when we say that no portion of our Union presents more flattering prospects of a profitable investment in every department of manufactures and agriculture, than East Tennessee.

She is the *nearest competitor* to the cotton growing country, in the sale of provisions and stock; her fertile vallies ensure abundant returns to the husbandman; her delightful climate is the most healthy in the Union; avoiding alike the extreme warmth of the South, and the extreme cold of the north. Her mineral resources of iron, lead, lime, gypsum, salt, coal, marble, &c. are inexhaustible. Her water power is unlimited and scattered over every part, to a most unusual degree; and finally a dense population is ready to insure success to the establishment of every kind of manufactory, and full employment to the mechanic in every department.

East Tennessee has hitherto held a peculiar position; hemmed in on all sides by mountains which almost preclude access, her merits have been overlooked. In other parts of the Union she is almost unknown; we may freely venture to say that no portion of the Union is so little known to all the others, as East Tennessee; yet she occupies the very centre of them all. The same cause which has operated so powerfully to retard the growth of Charleston and Savannah, has exerted the same influence on East Tennessee, viz. *the want of good roads*.

These she is now engaged in making; and in a very few years she will burst upon the notice of her sisters, with almost as strong claims to novelty as a newly discovered country.

JOHN C. TRAUTWINE.

Knoxville, Nov. 1838.

Note—The above is to be regarded as but a very cursory and imperfect sketch of the Southern Improvement System. Our object being merely to lay before the reader, some of its most important bearings.—*The Writer*.

Tables, from a work about to be published, by E. H. GILL, Civil Engineer.

TABLE OF THE DISCHARGE OF WATER THROUGH IRON PIPES.

(Calculated from Eytelwein's Formula.)

Diameter of pipe in inches.	Head 5 feet; length 100 feet.		Head 10 ft; length 100 feet.		Head 20 ft; length 100 feet.	
	Velocity of water in feet per second.	Discharge in cubic feet per minute.	Velocity of water in feet per second.	Discharge in cubic feet per minute.	Velocity of water in feet per second.	Discharge in cubic feet per minute.
3	5.27	15.49	7.45	21.99	10.54	30.96
4	5.95	30.52	8.41	43.14	11.90	60.66
5	6.57	54.59	9.31	77.36	13.17	109.02
6	7.07	83.26	10.	117.78	14.14	166.26
7	7.50	118.89	10.61	168.18	14.99	237.42
8	7.92	167.50	11.20	236.88	15.84	334.50
9	8.25	218.64	11.67	309.27	16.51	436.80
10	8.51	276.23	12.11	393.09	17.13	556.02
11	8.87	353.74	12.55	500.51	17.75	707.16
12	9.12	429.76	12.90	607.89	18.25	859.56
13	9.36	514.42	13.24	727.66	18.72	1028.82
14	9.60	619.25	13.58	875.98	19.21	1239.
15	9.80	721.53	13.86	1020.45	19.61	1443.66
16	10.	833.52	14.13	1177.75	19.99	1665.96
17	10.18	967.26	14.40	1368.22	20.37	1934.70
18	10.35	1097.36	14.63	1551.15	20.70	2194.56
19	10.50	1235.17	14.85	1746.89	21.	2469.60
20	10.66	1400.97	15.08	1981.87	21.33	2802.72
21	10.80	1558.56	15.27	2203.64	21.60	3116.88
22	10.93	1724.88	15.45	2438.19	21.86	3449.46
23	11.06	1921.25	15.64	2716.85	22.13	3843.96
24	11.18	2107.58	15.81	2980.11	22.36	4213.92
	Head 10 feet; length 1000 feet.		Head 20 ft; length 1000 feet.		Head 50 ft; length 5000 feet.	
	Velocity of water in feet per second.	Discharge in cubic feet per minute.	Velocity of water in feet per second.	Discharge in cubic feet per minute.	Velocity of water in feet per second.	Discharge in cubic feet per minute.
3	2.48	7.29	3.51	10.31	2.49	7.52
4	2.85	14.53	4.03	20.55	2.88	14.68
5	3.20	26.49	4.53	37.51	3.23	26.74
6	3.49	42.78	4.93	56.20	3.52	40.12
7	3.75	58.50	5.30	82.68	3.79	59.12
8	4.02	84.42	5.69	107.49	4.07	85.47
9	4.25	112.20	6.01	158.66	4.31	113.78
10	4.47	144.82	6.31	204.44	4.53	146.77
11	4.69	185.72	6.63	262.54	4.77	188.89
12	4.88	228.41	6.90	322.92	4.91	229.78
13	5.05	276.27	7.15	390.39	5.17	282.28
14	5.26	337.89	7.43	477.	5.38	345.39
15	5.42	396.74	7.66	560.71	5.56	406.99
16	5.58	462.02	7.89	653.29	5.71	472.78
17	5.76	546.04	8.14	777.67	5.91	560.26
18	5.90	623.04	8.35	881.76	6.08	642.04
19	6.06	712.65	8.55	1005.48	6.23	732.64
20	6.20	814.68	8.77	1152.37	6.40	804.96
21	6.34	912.96	8.97	1291.68	6.55	943.20
22	6.49	1024.12	9.15	1443.87	6.70	1057.26
23	6.62	1167.90	9.36	1623.02	6.85	1187.79
24	6.74	1269.81	9.53	1795.45	7.	1380.80

DISCHARGE OF WATER THROUGH OPEN CANALS.

Bottom 6 feet wide, top 12 feet, and depth 2 feet.				Bot. 10 ft wide, top 16 ft, depth 2 ft.	
Descent.	Velocity in feet per second.	Discharge in cubic feet per minute.		Velocity in feet per second.	Discharge in cubic feet per minute.
1 foot in 5000 feet	1.51	1631.88	1.59	2.48	2489.76
2	2.17	2353.32	2.3		3588.
3	2.69	2907.36	2.84		4430.40
4	3.12	3375.	3.29		5141.76
5	3.50	3787.56	3.69		5768.88
6	3.85	4160.16	4.06		6335.16
7	4.16	4502.52	4.39		6856.20
8	4.46	4821.12	4.70		7341.36
9	4.74	5120.28	4.99		7796.88
10	5.00	5404.32	5.27		8227.44
Bottom 6 feet wide, top 18 feet, and depth 4 feet.				Bot. 10 ft wide, top 22 ft, depth 4 ft.	
1 foot in 5000 feet	2.01	5808.96	2.13		8198.40
2	2.89	8337.6	3.06		11761.92
3	3.57	10284.48	3.77		14496.
4	4.13	11920.32	4.37		16303.84
5	4.63	13343.04	4.90		18835.20
6	5.09	14667.84	5.38		20670.72
7	5.51	15868.80	5.82		22360.32
8	5.89	16983.36	6.23		23934.72
9	6.26	18034.56	6.61		25409.28
10	6.60	19028.16	6.98		26807.04

Sketch of the Tunnel now under construction upon the Chesapeake and Ohio Canal, at the Paw-paw bend of the Potomac River, by ELLWOOD MORRIS, Prin. Assis. Eng. January 1st, 1839.

This Tunnel was adopted to avoid a circuitous navigation of six and a half miles and some very expensive work at the pass of the Paw-paw Ridge.

Of this six and a half miles the U. S. Engineers in their celebrated report on the Chesapeake and Ohio Canal (Ex. doc. No. 10, 19th Congress 2d sess.) speak in these words: "In approaching the neighbourhood of Paw-paw Ridge, the difficulties gradually increase until they reach an extent that is truly formidable, and will require all the resources of art successfully to overcome them."

Although their distinguished engineers did not, in their report, recommend a Tunnel through the Paw-paw Bend, to avoid the difficult passage around it, yet Lt. Col. Abert (now Col. and Chief of the U. S. Top. Eng.) who directed the surveys upon the Potomac, marked upon his map of the pass of the Paw-paw Ridge, a Tunnel line which he recommended to be examined before finally deciding upon the plan of this division of the canal.

These considerations emanating from such high authority, induced a careful instrumental survey of the pass; which resulted in the development of a Tunnel route, immediately at the gorge of the bend, cutting off about two miles more distance than would have been done by the line indicated by Lt. Col. Abert.

This route as finally laid down (by C. B. Fisk, Esq., Chief Engineer of the