

huge embankments, at the expense of making an equally deep cut in the Eastern divide and of raising a second dam at Machuca Rapids, either retaining the site at Ochoa, or replacing the dam there by one at Tambour Grande below. Of this prospective change Admiral Walker says:

"We have had some parties out to find how far we would have to run embankments, and it is quite possible they may be as bad as the San Francisco embankments. . . . I think the chances are, by putting a dam at Machuca and a dam below at Ochoa, or Tambour Grande, and taking a low-level route, we may escape this heavy work and get into Greytown with considerable less expenditure of money, and with a canal that would not, perhaps, keep its superintendent awake at nights so much."

Evidently the plans of the Nicaragua Canal cannot be regarded as definitely determined. But it is not only in the construction of the Canal proper that serious difficulties are to be encountered. When the writer traversed the transit route in 1856, the harbor at Greytown was open to the largest steamers, and presented no difficulty. Today, owing to the travel of sand along the coast, under the influence of the winds and waves, the port no longer exists for sea-going vessels. The jetty constructed during 1890-93 by the Canal Company has proved a total failure, and the problem is now presented, not in the simple form of making a new port, but of reopening an old one which nature has decided to close. American engineers have had experience in the difficulty and cost of such constructions at Fernandina, at the mouth of St. John's River, at Brazos, and at many other points; and before undertaking a canal it would seem to be prudent to reopen the port and determine the first cost and the probable annual outlay for maintenance. A canal, access to which would be subjected to occasional interruptions from natural forces now known to be in action, would be a serious mistake; and it may be added that a study of the six charts accompanying the report of the Ludlow Commission, showing the condition of this port at five different dates between 1832 and 1895, is not reassuring.

As to the important element of the cost of the Canal, there appears to be considerable difference of opinion. The chief engineer of the Company estimated it, in 1895, at \$69,893,660, and the Ludlow Commission, at the same date, at \$133,472,893. Engineers will recognize the impossibility of exact figures in the present state of the investigations now in progress under the Walker Commission; and each of the members has carefully guarded himself from expressing a definite opinion. Admiral Walker, at his recent examination before the Senate committee, said:

"We have made no figures. It is no use to figure on the thing until we have all our data. But I do not see why that canal cannot be built. I should think myself, speaking as anybody in the street might speak, that the Canal could be put through for 125 millions; and it would not surprise me if it came considerably below that."

Prof. Haupt, on the same occasion, stated that he thought the Canal could be built "inside of \$90,000,000."

Gen. Hains said:

"I think a canal of the dimensions that have generally been referred to—

30 feet deep, with locks 650 feet long, and all the cross-sections that have been referred to as necessary in rock and earth—could be constructed for a maximum sum of about \$140,000,000, with a possible reduction of \$25,000,000 or \$30,000,000. . . . But the trouble is that just now I am not prepared to give an opinion that would be worth anything."

Evidently in view of previous experience in such works showing that the actual cost has usually very largely exceeded even carefully prepared estimates, it would be premature to form an opinion as to the outlay that will be required for the Nicaragua Canal; but a general idea of that demanded by the two routes may be formed from the following comparison:

Panama.	Nicaragua.
Two good harbors now existing.	Two harbors to be created; one of them (Greytown) presenting unusual natural difficulties.
A good railroad now existing along the entire route.	A long and difficult railroad to be constructed, which Gen. Hains considers should extend along all the route, except the lake portion, <i>i. e.</i> , for a distance of 120 miles.
Actual construction, now well advanced, (about two-fifths entire length actually completed) and remaining difficulties accurately known.	Practically nothing done in way of construction, and many of the essential elements undecided.
No constructions projected which are not justified by recognized engineering practice.	One or two dams projected wholly without precedent in canal work; and many embankments which must be permanent elements of danger.
Except the works at Bohio, no difficult excavations or constructions to be made where the annual rainfall exceeds 93 inches (only about 50 per cent. more than on our Gulf Coast.)	The most difficult works lie in a region where the observations of the Canal Company indicate the annual rainfall to be nearly 22 feet (256 inches), or nearly three times as much as at the Panama sites.
Route lies wholly in Colombia, where all interests will be benefited by the Canal.	Route lies on the border of Nicaragua and Costa Rica, where local jealousy already exists, which may prejudice the interests of the Canal.
Distance to be lighted and supervised when the Canal is completed, 46 miles.	Distance to be lighted and supervised when the Canal is completed, 176 miles, or nearly four times as great as the Panama.
No active volcanoes within about 200 miles of the route of the Canal, and earthquakes therefore less probable.	Active volcanoes near route: one, Omotepe, on an island in Lake Nicaragua, and another, Onose, only about 40 miles from the locks. An earthquake on April 29, 1898, at Léon, destroyed several buildings.
Cost carefully estimated on detailed plans at about one hundred million dollars.	Cost estimated by the Government Commission, on data recognized as wholly insufficient, at about one hundred and thirty-three million dollars.
Concessions from Colombia (upon which whole undertaking is based) ample, satisfactory, and unquestioned.	Concessions from Nicaragua and Costa Rica (upon which whole undertaking is based) either expired, or expire next year, and officially declared by Nicaragua to be forfeited and void.

But let us assume that both canals are constructed and open to navigation, and then compare the two routes, by considering which of them would undoubtedly be selected by vessels seeking to cross the Isthmus. This is a crucial

test which will reveal their relative merits:—

Panama.	Nicaragua.
Ports both known to be good and easy of access.	Both ports artificial, to which access may be doubtful, especially on Atlantic side.
Length of route 46 miles, and time of transit 14 hours.	Length of route 176 miles, and time of transit not less than 44 hours.
Summit-level probably 103 feet and perhaps only 66 feet.	Summit-level 110 feet.
Locks double from the opening of the Canal, one chamber 738 by 82 feet, and the other 738 by 59 feet, with intermediate gates.	Locks single (subsequently to have another chamber added); dimensions 650 by 80 feet.
Curvature gentle. Smallest radius 8,200 feet. Of the 46 miles, 20% are straight, and 15 have radii equal to or exceeding 9,850 feet.	Curvature too sharp. Smallest radius in Canal proper 4,000 feet. For 68 miles the route traverses the San Juan River, where, to gain 47 1/4 miles as a bird flies, it is necessary to travel 67 3/4 miles—a loss of 43 per cent.
No troublesome winds or river currents to be encountered even in times of flood.	Heavy trade-winds and strong river currents.

It would seem from this analysis that there can be little difference of opinion as to which is the better route. But perhaps some enthusiastic advocate will say, "The Nicaragua Canal may be the more costly, may present more natural difficulties, may require more time for construction, and may be less easy of transit; but let us have an American canal, made with our own money, and wholly under our own control."

Such considerations are outside the province of an engineer. But, perhaps, it may be suggested that we have already interests and responsibilities on the Isthmus, where the Panama Railroad was built and is now controlled by an American company, under American protection; that the business control of any canal must vest in its stock and bond-holders, in time of peace, while, in fact, in time of war—unless its neutrality be guaranteed by the great maritime Powers—the transit will be controlled by the belligerent having command of the sea.

May it not, then, be wiser for our Government to extend its powerful assistance to what Nature has determined as the best route, rather than to expend more time and more money for what, after all is said, must remain a distinctly inferior canal, unable to compete with its rival for the commerce of the world?
HENRY L. ABBOT.

WHEN YOU ARE DRUNK.

A legal friend has kindly expounded to us for our guidance what constitutes intoxication according to the decisions of the courts. It seems that it depends more upon what state of the Union you are in than upon what state of decomposition you are in. You may be as drunk as a boiled owl according to the rulings of one state and fit to exercise all the privileges of citizenship according to those of another. In Oregon you are not drunk in the eye of the law so long as you can lie on the ground and hold on to the grass. In Virginia you may be so overcome as to find it necessary to lie down in the road, but while you can wave your arm—or your leg, no doubt—at an approaching team, you are not legally intoxicated. We shall note these valuable distinctions carefully, and govern ourselves accordingly when next our travels take us to Oregon or Virginia.