Hi Excellency,

Commeheiro,

João Sérgio de São João de Serimba.

Survey of the Upper San Francisco by the Comissão Hydraulica

1879.
Dimensions of Steamer
"Presidente Dantas"

Length - 98 feet
Beam - 14
Wheel House - 26
2 Cylinders - 12 inches
Stroke - 24 in
Diameter of Wheel - 10 9
Width - 410
Number of buckets - 10
Depth - 10 in

Boiler length - 10 8
Dia. - 5 9
Tubes Dri - 2 1
Number of tubes - 96

Pounds of Steam Av. 35 lb.

40 lbs. give 26 revolutions
35 lbs. give 20, Machinista says
30 lbs. give 17

Draft when loaded - Forward 3 3/8
Aft 3

1 Cubic Arrou = 35.287 Cubic Feet. Say 35.28

2d. Measurement of the river flow at Piranhas
January 28th, 1880. S. Lisbon

Total Area = 53.31 Square meters
Volume per Second = 21.96 Cubic Meters
Mean Velocity = 0.741 per Sec. = 0.92 M. per ft.
Greatest Depth = 48.4 Meters.

The above is based on 0.9 g. the Superficial Vel.
Taking it at 0.8 it would give as follow:

Volume per Sec. = 19.52 Cubic Meters
Mean Velocity = 0.86 per Sec. = 0.81 M.

NOTE: The river is about 9 M. higher than when
the 1st Measurement was made Aug. 1879.

I Call the flow Jan. 23rd, 1880 - 2000 c.m. per
of 120,000 Cubic Meters per minute
= 4,223,600 Cubic Feet per minute.
The steamer "Jequitata" arrived this morning, and brought me a telegram from Mr. Pinho saying in substance that if I had to wait for the launch Paulo Affonso, it would be more convenient to wait at Penedo. Than at Piranhas, on account of the small current at Piranhas, and in regard to the exchange of letters, although it might be available on account of the draught, it might be some disadvantage on account of the journey of the engineer.

To which I sent a telegram, to be sent on the steamer "Jequitata" to Penedo and from Penedo to Rio de Janeiro, as follows:

"Sr. Com., Plínio de Oliveira.  
Rio de Janeiro."

Your telegram dated Penedo 18th, received here. Tomorrow the Commission starts with pack-brain for Jutobá. Engineer: Trangy will construct canoes for the launch Paulo Affonso, but we will begin the survey with canoes. Much time may elapse before the launch can reach Jutobá.

I have some notes of the bar and the main before Penedo, and will get more on my return.

Letter went yesterday by the Steamer.
Thursday, Aug 21 - Continued.

Chico Piranhas.

Young Secretary during the week with the aid of the Carpenters and our Cooks, I also made a list of additional provisions to be had from Venturi.

10 sacks Ferrinha 4 cases ginger
2 c. Bacco 2 c. Soo Venturi's
4 c. Rice 1 c. 1/2 c. Feijao
100 lbs Sugar - Custom Confection for
50 lbs Coffee - man's wear - Day 1 c. iron - Ferrinha
1/2 c. Feijao
1/2 c. Carne Bacca

Mr. Venturi said we would need 6 men to eatch double canoe. If we had 4 double canoes 22 men. I will try to get along with 3 double canoes and 16 men in place of 22.

My arrangement is to go to Rodonada with the 1st train instead of stopping it at first. Mr. Venturi indicates to Mr. Weisen, upon the inquiry being made, that the charge to Jaguar would be 6 miles per animal and to Rodonada about 4 miles per animal.

Today Chief Eng. Konig has dispatched a man to take a - Rodonada and Cordoba. He engaged Canoers who he says will reach Cordoba in 5 days and report and report to us.

After writing the letter, I wrote a telegram to Commodore Finian, sending copy of telegram and referring to Mr. Konig for assistance for Ventura and also to Mr. Dyer in Massa.

We then returned to Mr. Konig's home - Mr. Loboro in company and had another excellent dinner.

After dinner I wrote in my Diary and made the memorandum of the day in this book.
Friday Aug 22. 1877.

We breakfast at 8 A.M. Hoping to start some time to-day for Patauba. Rode in to office—some of the pack animals were here, and Mr. Weer arrived particularly to getting them packed, seeing the leading man had bought two guns—around $5 a piece for the other top—The guns that the men bought were only $8 each, and the pistols on $7 each. The other guns for sale were $25 each.

Mr. Kane paid

Mr. Weer took a note of the rate of wages of the men—the 12 who are to act as a kind of body guard—and a Mauka. While these things were being attended to, I finished a long letter to Addison, another long one to John Boyle—One to Dr. Mary, and one to Sister Margaretha Mclure.

Mr. Weer proceeded in loading and starting 22 pack animals. Says it will require

33 more animals to complete all.

We engaged sails for 2 larger boat—2 cape, and one small boat—2 canoes.

Conclude that, in season, cannot get away till about midday tomorrow—If not

As about 5 P.M., Mr. Kane, Mr. Weer and I rode out to the House and from dinner.

After dinner I brought up my Diary and finished out the letters to take with me tomorrow.

Brought up my daily Diary.

Shi.

This evening wrote to Chap. A. Colburn,

Reading the Dollar Savings Bank

No. 124 4th Ave. Pittsburgh, Pa.,

enclosing him my Check on the 3rd National Bank of the City of New York No. 408 for $100, requesting him to credit Mrs. Adeline L. Roberts in favor of Mr. O. Roberts for the $100 and asking him to send it to Mrs. William Roberts, 2nd St. and C. James 47 Rue 1er mort, Rio de Janeiro, Brazil.

I then wrote on another page and a half a new account of what I have been doing, learned, and seen here, some idea

of the San Francisco news.

And in a P.S. I ask him to mention the rest of this letter to Mrs. Thea. P.R. or

Mr. Christies or any of the family, saying I

hope to write to them within a week from

the Upper San Francisco.

Tuesday Aug 19.
Saturday, Aug 23rd at Piranhas.

At the house of Mr. Kienger.

We got some fresh arrangement for the pack animals, and our bills at Ventura were being made out, and all the details of the train from Chief Engineer Kruger were being made out. I wrote an article for the San Francisco Star, a friend of Mr. Kienger, and sent it to Mr. Kienger. I had no time to write a letter or note to accompany it, so I had finished it. I had to attend to and sign the bills and papers. Mr. Kruger, Mr. Premier, and Mr. Ananato had a discussion as to the form to be used. We got a copy of the form used by Mr. Kruger.

"While on the road..."

Mr. Kruger hands me a bill for $352 to the chief of the "Comissão da Relação" to the Estrada de Ferro Paula offiers, amounting to $854.22.

The bill, of Ventura:

"Ser Monar" - The two

The sum, amounting to $2943 was to be paid by Chief Engineer Kruger.

I got in for a car at the station of Piranhas.

We set off from Piranhas at 11:30 a.m. and rode along the line at nearly 11:30 a.m., with the train, which was due at 1:30 a.m. at Piranhas. We took the train in Piranhas and continued our trip to the station in Piranhas. We proceeded to the station, obtained the big book, 12½ cents deep, 15½ cents daily, 1500 meters - 4500 meters, about 1800 meters. We arrived at the station. The first night at 9:30 a.m.

Saturday, Aug. 23rd on the Railway Co.

We started from the house at 11:30 a.m. and rode along the line at nearly 11:30 a.m. with the train, which was due at 1:30 a.m. at Piranhas. We took the train in Piranhas and continued our trip to the station in Piranhas. We proceeded to the station, obtained the big book, 12½ cents deep, 15½ cents daily, 1500 meters - 4500 meters, about 1800 meters. We arrived at the station. The first night at 9:30 a.m.
Sunday — Aug. 24 — Olio d'Agua

12 Sunday, Aug. 24 — Olio d'Aqua

Bacharel — Plotino — Shara.

At 6½ a.m. Mr. Knight, Marcellus, Plotinos, Aguirre, Remigio, and I, mounted on horses and rode back, one another over (double the length of the one we rode last night), to the leading line. From thence back; the sun was seen passing along in the dusk.

We rode along seeing some cattle with much greater and more appropriate many — sandstone — but the height of the openings of the Caves. The Caves are much greater than the one we examined before breakfast.

Some used for Motto, is about 12 miles. Costs 21.20 per access (clay). Mr. Darby was not seeing the Caves. D'Alberto is greater than he has seen.

We soon came on the 2 per cent. grade on a piece of line principally finished, and not located. The Caves filled are good. The sandstone now prevails along him. But I saw one excellent earth before that.

The Summert Cut (referred to page 11) is about ½ mile in amount of labor and three months the quantity of material is considerable amount of earth being in the ascending portion of the 2½ per cent. grade before reaching the Cut, nothing level for a short distance, then a 2 per cent. descending grade began, same through the rest of the Cut and about 2 kilometers beyond the face Cut to the Station — Olio d'Aqua.

Mr. Marcellus said that 2 factors: Bacaracas (when they are) and 40 or 50 men have done this work for 14 months, beginning in January. I am surprised at the quantity given that have done even more heavy work and until recently some of them have come.

We had intended breakfasting at 10 a.m. but breakfast being ready here we stopped breakfast at Olio d'Aqua.

Left Olio d'Aqua again after breakfast Mr. Plotinos — Burmese Engineer accompanying us Mr. Marcellus, Chief of Section, who was with us from Pirahnas. Parted with us here, and returned to Pirahnas.

At 11½ a.m. in the midst of a very rocky region Sandstone — in semi-place, Many filled one among another with large grey ridgy slabs. At 11.30 we left the Rio Corda — Rio water only at bed bottom of Cocones sand. Sometimes water flows by but not in great quantity and not long at a time. We have 15 minutes and take cold water at 12.10 in which Talhada —

...
Sunday - Aug. 24th

To T. de Pedro.

A few miles beyond the SE. from us, at a distance the mountain hills and valleys appear as if clothed with forest; but when near, it is seen that they are only the SE. declivity, low hills with Cacti in great abundance, and a thin Sandy, or Rocky, and almost bare land. Only a few small exceptional spots, which have been cleared and cultivated — a little, very little, corn, and some vegetables. Milers are very busy, but the people, the few who belong to this region, in deep units, of the railway, work to not attempt to raise much of any thing except Cattles.

In the midst of the country, trees and Cacti, there an grass and brooks which afford grazing, when the region is not devastated with cattle. But the superficial appearance of the earth, the flocks of the clay beds of sand in the bottoms of the rivers, showing that only by intervals, and for considerable other periods do they have flowing water. These are true springs in the beds of these streams, which would be killed were the streams to be flowing with water. Continuing even for a few months...

The great want and need of this country is water, and a deeper soil. Probably this is true a very region, the disintegration of the rocks might have been quicker. If first had been an accompaniment the disintegration would have been much greater.

The soils, as a rule, show very near the surface, not only in the railway cut, but are along the roads we travel; and are the ridges and Meters are only. Along here they sand Stone.

The thermometer, about 12 miles from here, is a white marble, which makes good time.

At 3.20 we leave Tàlhalde. Mr. Derby in car and ride 12 Kilometres, by the road to Pedro, much of the way in height of the railway, closing the same to our western this afternoon.
Arrived Pedra at 5.35 - and find the main body of the Commission awaiting our arrival. We are to spend the night at Crockart de Sa - Chief de Secção.

Liviós dos Reis - 1st Lt. Eng.

Beautiful view of distant mountains, with cultivation on the mountain sides and at the foot of the mountain - P2m. 22 C.

6.10. Liven on Cape - Stop me, 6.10.

Crockart de Sa’ - Chief de Secção

Liviós dos Reis (Capt.) 1st Lt. Eng.

These engineers are in charge of the second Secção, which begins at the “Rei Once” - where we shall be.

Our entire force, with 3 Carneys to gather the cattle, MM Sa, MM Sá, MM Sá, MM Sá, MM Sá, MM Sá, MM Sá - then we are all ready.

A lovely moonlight night with Venus just rising and Jupiter just rising, and a delightful temperature outside the day. Our programme is to go tomorrow after an early breakfast - to the Great Falls of Santa Catarina - here to remain over night - and return on high day, come back to the Road Route line.

I am provided with a comfortable bed, so, bidding all “good night” I turn in with ‘blessing all’. I say Good Night.

Here is a very pretty situation; but a large proportion of the ground on the east appears to be full of nothing but grazing, leading to the security of water and the Mine (Crome sands) soil, the rains here, as elsewhere in the region as far as we have traversed it being my near the surface. The drinking water at the Impresso: Here it is of good quality. It is rain water. But rain does not always occur here. This reason is said to be exceptional and the weather which now prevails disappears.

It is said that they have water on the mountain range 3 miles north; and I have no doubt this is correct.

Breakfast:

8 ½ A.M. I learn now that there is a village of Ambaridenses here at the foot of the above mentioned mountain.

9 ½ A.M. We start for Falls of Pauco Affonso. In one Kilometer, in cross the railway, Change, and get our mode to the gale. It is undulating, sand-stone, near and on the surface is broad. Style river, casca, seamed, lined, well for cattle both pork and mutton. An occasional house - suppose cattle raise.

10 45 A.M. Rock is different - not ordinary sandstone but granite. We pass a hill.

10 50 A.M. Start.

11 00 A.M. Pass a Chiquita of wheat - with a pumpkin field. Met with watermelon group. Otherwise - no agriculture. Road is plain, south; in other places filled with globules of quartz rock - white quartz, there may now be gold very near beneath.

12 00 P.M. Arrive in Caza - Marcellino. A large 25 man, with quiz, a family. The Caza is a quarter of a league - about ½ mile. The men - and about 2 leagues to the Falls. Here we get a bunch of rice, figs, mutton and coffee. - and conduce to rest on the hills. It is now very hot; but it is warm. True an elephant flying and a elephant horse. It is quiet pleasant in the shade. The ground around here looks a little more fertile. We have some sources, with still a little water in them and foci.

We remained at the Marcellino (Caza) of M. Marcellino 2 hours - resting and making packaging the animals. Having our only the baggage. M. Marcellino and some passed on.

Their were opening cotton in the near primitive style, winding the incision of a wheel. All done with their fingers. The Coast was my white's face beautiful. The Coast was raised at or near the foot of the mountain in front of the Fazenda da Pedra. Referred to being from 15 to 20 miles from this Caza.

They raise nothing here but cattle, & goats. They have a good milk, and make some butter and cheese here; but there is here no agricultural abounds. This place is within one mile of the S. Francisco River.

2 P.M. We start and ride 2 hours at about 5 miles an hour to the Falls of Pauco Affonso.

Day 10, or 9 miles.

Here are two mounds 3/4, and a shea for animal. In parts covering with leaves. In shelter.

On the route in parts along the river and yearly parallel with the rocky, Mt. Cape, Serro de Alegria, nearly the same. Thin sandy soil, red near the surface, low, and scattering trees. For a few miles there was a stone of querns - two 3/4 or quili. Called - said to be the best native querns Brazil. - The other stone called - lore and has a conventional to our tribes, though it is not this.

An Indian, who acts as guide to those who have a guide, went ahead and got to the river as they think it of the Falls about a mile from the Camping place below our camp. Camp in a shea 1/2 miles from the river about the Falls. To save the river, but was glad, otherwise that it was only a red - thing, and not the Great Falls. On our way to this in favored. The musk痣wee put up in Oct 20, 1859. I was in Brazil in the Province of Rio do Janeiro, when the Emperor made this visit.
August 25 - Monday - Paulo Affonso

On arrival at 4 P.M., at our Camp, we went on our return to the viewing point - an Indian guide, who was necessary to us in front of some events having occurred - and when we were returning - they told us they had seen the falls from what I had seen and heard about them, I was satisfied that they could have had only a partial view - at some one point - and did not.

We saw the Falls, on the Bahia side, which is from a Canal branch of the main stream - which is 400 feet - divided by a Island in the middle - a Territorial flag of Spain - and saw the Mouth of the Cave, which is near the White quartz below the Falls, on the Aguaris side. The Stone falls are 400 feet high, falling on an average from 200 feet above it, and it is about 140 feet long.

The Movement on the left hand side, from the tunnel, the pliability, unity, and artistic effort are amazing.
The Bronze piece is not enough:

The very grand and beautiful now. In higher water, or even in a half star, it must be sublime.
The Volume of water is now enormous, and our Calculations which is entirely different.

One good thing about this monument is that it was created by the President of the Commission in 1836 - and not by his name but upon the plateau. Only the President, with various names and to appear as names - It is a work of art, and the work is entirely natural's work.

The whole piece of stone that appears to be points to near the Falls, and they have to request a court to build in.

The water seems to have cleared the rocks. Black powder,
**Journal Entry: August 26, 1869 - Colusa Appenese Falls**

Just below the present sketch is one of the many points of interest in the Surveyor's Map, showing the location of the falls. These falls, known as the Colusa Appenese Falls, are situated on the Colusa River in Colusa County, California. The falls are significant for their height and the volume of water that cascades over them. The river is known for its scenic beauty and is a popular spot for water sports and fishing.

The falls are surrounded by lush vegetation, including redwood and oak trees. The area is home to a variety of wildlife, including deer, elk, and a diverse array of bird species. The river is also a spawning ground for several species of fish, including the Coho salmon and the Steelhead trout. The falls are a popular spot for outdoor enthusiasts and nature lovers alike.

**Map Details**

- **Location**: Colusa Appenese Falls on the Colusa River in Colusa County, California
- **Height**: Approximately 25 feet
- **Volume of Water**: Varies depending on the season and rainfall
- **Wildlife**: Redwood and Oak trees, variety of bird species, Coho salmon, Steelhead trout
- **Activities**: Hiking, fishing, bird watching

**Map Notes**

- The map indicates the falls as a significant point of interest for surveyors and explorers.
- The surrounding area is marked with various vegetation symbols and contours to indicate topographical features.

**Additional Information**

- The falls are a key feature in the regional geology, providing insights into the geological history of the area.
- The river is a major水道 in the region, supporting a diverse ecosystem.

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*Map and text continues on the next page*
Tuesday, Aug 26th - Paullo Affonso to Moxoto.

About 7 P.M. our party began to prepare to start - which had been fixed for 2 P.M. Our journey, it seems, to the shore of the river and the fall of 10 children: he brought along my pair of watermelons - one of them a white one - which we descried... I took also about 1/4 of wine... The man lost 85. Currus by a drought - he has 50. The rain fell on the morning. It began in the early morning as a fine rain. It made the grass green, my wife - which lasted both plantation.

1:45 We start and ride up the river... Not exactly on a dry bank, but at the irregular gently sloping bank with many gathering trees and no much chance for cultivating any thing. About 2 miles from our Camp. It is a tributary of which was once soil, and of a more clayey nature.

2:45 One league which we leave the river, soon after having crossed a dry river.

The Caves, called the S. Francis in Bahia at this part of the Valley, other Cultivation - and there is a little on the Alagoas side, in a few miles from the river... We strike to the Moxoto river - which would be quite a considerable stream if filled with water - and is for heavy rain. Now it is entirely dry. Some nice Cultivation by the Colonial population. Chiefly: water melons - in one place in row tobacco - the plants look thriving - but there has been some failure of larger magnitude, and re-planting has been done.

4 P.M. We reach the dry bed of the Moxoto, 500

leagues, wide, sandy, djog, and we are now in Perimbari - in nine wide along

We have arranged to go to-day a short journey by another station on the 7th Division, Sr. Lobo's.

Our position is near Pirahbina and the border for the Caray has not yet arrived, so they are at Ocho de Agua tonight.  It is foggy in the morning.

Our track appears to be about 50 kilometers from here.

8 1/2 a.m. - We will breakfast, and start later.

The railroad line crosses the Monclobo River just below here, and is at an angle of 20 degrees.  We have run a small dam here, and it is about half way between the river, slightly more than 200 meters and about 30 kilometers from here.

8 1/2 a.m. All up.  This is called to mount.  We must have been a misunderstanding and the people here, as M. Broussard supposed, intended preparing breakfast but they did not understand.  So we rode 15 kilometers (about 10 miles) for breakfast as our position has given us with our train.  After, I had an eagorous cup of chocolate and some cake.

We rode along in sight of the line much on the way, crossing at several times, an area going smoothly, the gentle undulation - curve of large radius.  These curves be steady and we will not that the ride is not for beneath the surface.  We stop and examine a water tank at each.

The ride is about 20 kilometers - about 10 miles.  We find the river at 10 kilometers before we see the station.

Our position is not far beneath the surface in the area.  We ride 3 or 4 kilometers before we see the river.  We see two other tanks on the route.

The river that we treated was built with a wall, and we wonder if it is good.  These tanks were necessary preliminary to working men and horses on Construction.

10 35 a.m. - We arrive at Station Quixaba - of the Sdr. Albuquerque - Characu - in charge of the station.

Quixaba - pronounced Kisha ba is in the gently sloping side hill at the foot of the Serra de Capivara.  It is a continuation of the Caracu (Serra) -

There is a plateau or hill of the Serra 4 or 5 kilometers from here, called Serra de Bresya.  But they are not in the main range of the Serra Caracu.

Memorandum!!

The Cachoeiro de Rogado - is in the S. F. River is about 5 kilometers below this station.  The Cachoeira da Hespanica is about 1 kilometers above here.  At Court, there is a sharp bend in the river.  The Serra Bresya - Bojongo de Ferro is part opposite the falls.  About 1 league below Jatoba.

The river just below the Iaparica Falls is very narrow, confined between rocky shores, but just above the falls, the river is very wide 3 or 4 kilometers wide.  Canoes can easily pass the Iaparica Falls in its present stage of the water.  There is an island (Three much in two islands) as a man who claims to know says that there are three channels.

Mo Krause's sketch or map may represent an island.

Cachoeira do Boro - Below which there is good canoe navigation to the summit water above the Falls of Paulo Affonso.  In about 1 league above the Falls of Iaparica, and the Boro Falls is passed with canoes in higher water.

Snr. Albuquerque.

Came in a nice breakfast about noon. A new q. nice White House - Police - The last.

Canoeeru de Rosado - About 2 1/2 leagues below Cacacuera do Itaporare. There is a strong current here, but Canoes can pass. To vary my informant, an emphatic point, Colonel closely inquired.

Memos.

Mouth of the Rio Mocho - appears to be about 5 leagues below Cacheu de Rosado.

About a league above the mouth of the Mocho appears the Cacheu de Tigre. Informant says it is small - that Canoes can pass it near a lemon plantation.

Note. That if the River ST. can be made fairly navigable down as far as the River Mocho - the Railway could turn down the Mocho, and then at or near its mouth. In that case, probably, the Railway line might have to leave the present route 12 or 13 kilometers before reaching the Mocho Run where it is now located.

Memos.

Much depends upon the nature of the Falls of Itaporare - and something upon the nature of the Rosado and Rosado Tigre; all of which are below Itaporare.

Snr. writing the foregoing, I have read Burton's account of the Falls of Itaporare - from which it appears that they are much for good & thus a considerable advantage to the Railway. If so, there can be no doubt that the location of the terminus of the Railway on the high S. Francis site is above that Park. But - whether it would be better below or above Tabora - I cannot say.

With the new location of the line it is transition to be at or above Tabora.

See future observations (Aug 27) Quixambo.
August 28, Thursday, Sattoba Eng. Station

G.A.M. - 1125, on the Engineer Station - The Coast.

We walk along a paved road to the river; and here it is a river, broad and smooth - not less than half a mile wide - with high sandy alluvial banks, with little farms on both sides of the river, but located too near the Mance in the Bahia or Right Bank. The general valley is wide and open except a few slow flowing creeks and brooks.

At the particular point there is a shallow cove, some 200 feet high, with 6 to 7 meters depth on either side of the entrance. It is a good protection in a wind or a medium to strong seashore; but I should think from the steady water worn fishing marks that in high water there must be serious shingle currents right here.

I walked down along the side line which came up the river for nearly a mile. Then one of the sweep boats followed the sand bar which begins just below, where there is a large deposit of sand, and when the river begins to bend to the left, downstream. There is no obstruction or anything to break the smooth surface of the river; but I can see that sand bar extends on this side and that the main channel opposite here is for the Bahia side of the river, or possibly near the middle.

The only point unsettled in my mind now is, whether a terminus could have been had several miles below the place selected, without having more than 2 per cent grade after leaving the river. Whether there is a place as good in low water and as good, or better, in high water? If there is, and if the channel is a sufficient depth from above to such point, it would save several miles of railway.

Sattoba Port - That is to be.

The place selected is at a point on the river where there is a deep water (6 to 7 meters) in low water, with a perpendicular frontage of rock ranging from 14 to 15 meters above low water; and behind that a sandy, clayey bar counteracting the rock at a height of about 15 to 16 meters above low water.

The river rises in overflow about 10 meters above low water, so that the level of the overflow line is 5 meters above the average height of the frontage of rock and at the railway grade is 6 2/5 meters, that is, 7 meters above the average water frontage. This water frontage has a gentle concave curve - say 50 degrees with 3 4/5 Change. It may be less or more.

In theory, there is a point of rock which, just a little to the left, takes the force of the current, and makes it easier to handle the approach of the river. The great width of the channel and its depth on the Peresimbrice or left side also makes the current and here there is a little face to the river. The river here, toward the Bahia or Right Bank.

There is a point on the Bahia side about a mile above Sattoba which throws the water over to the Concave Pernembrice side. Now, the overflow of Sattoba helps to throw the current over to the Bahia side, and Mr. Weier says that the channel does not get back to the left bank before meeting the Falls of Sta. Maria, that is, continues with about a 2 per cent grade all the way shown from Sattoba to the falls of Sta. Maria; if so, then there can be no doubt that the proper place for the terminus on the Upper San Francisco has been selected.

The approach to it begins at the Morro Bay and a point about one mile from it on the right, and then has less work, and not having more than 2 per cent grade, in getting out from the river, is probably the better location.

I looked at the ground for the approach from the new direction. Mr. Weier suggested a critical point on the American shore of landing and unloading from between boat and barge. A simple crane can do all the work of transferring; no such even a considerable crane - a good move could be laid.

A settlement of some kind may be more of a need, but a safe harbor is not a necessity.
Thursday, Aug. 28th. Rodonde - Atalha.

[Showering during the day.]

We leave Itabara at 2 P.M. - arrive opposite Rodonde about 3:45 and at Atalha at 4:15 P.M.

Itabara at present, nothing - Eng. quarter, mrs.

Rodonde - consists of about half a dozen houses scattered - amounting to with men than nothing. we did not stop in Rodonde.

Atalha - is less than Rodonde - and more than Itabara. The Casa of Jose Manuel de Souza, is the principal and only house of business, apparently. He says there are 2 small canoes here. He says a canoe can go down to Itapua in 2 days.

Thursday, Aug. 28th. Conclude with a dinner & Camp-light under the porch of our new friend Jose Manuel de Souza, and talking with our friends, Mr. Kriger and Mr. Lebata, Chef de Secos.

Mr. Kriger started at 9 P.M. with Mr. Lebata taking with him my letter, over to St. Pliies, the other to my wife. It is a fine moonlight night, and they will ride to Quezada in 4 hours.

I learned during the night, but not hard.

*Quarrel of the negroes are mostly much finer than any of the Christian have seen. Sampao's face exquisitely conspicuous. All of the Communis are well, and defend the Gardener.

Commended to P. L. in Atalha about 10 A.M. Aug. 28th.

5 days ago. We left Pio in accent the 28th, and arrived here this evening. Mr. Kriger who has accompanied you are the way intends returning back to the port, and so bring the opportunity of seeing North. Finally briefly.

I write first mentioning that Mr. Kriger and his staff, all along the route, have a distinguished the member of the Commission. With most cordially, our journey this far and hope our journey to pass as pleasant as possible. We have passed near the entire line of railway, and we have seen the land that has been visited, besides having the pleasure of viewing the Falls of Pedra Doffo - in the afternoon of the 25th and managers of the 26th. The Falls exceeded our anticipation.

I learned from five different points, and surely the views are grand, much finer than any of the pictures I have seen. See back on left.

Last night we slept at Quezada - and took baths about noon to day at Itabara - the last station of the ligne of the Paulo Afons, Rail, etc. Our train back from Quezada is behind, but expected to reach here tomorrow - at about 11 P.M. There is nothing whatever except the Engineer Station house.

Rodonde has half a dozen men here, and Atalha consists of a few huts, and one sort of house Jose Manuel de Souza, who own the little business.

The Country thin for yields, scarcely anything.

Our man who went to Cabo to get Canoes for us and our baggage, is expected back to-morrow. Meanwhile we are encamped here and will travel more on the river tomorrow.

I will write to you everything on my return, and every opportunity a day or two later. I wish to write more carefully about these things.
We left Pernambuco in the 23d of August, accompanied by Chief Engineer Xerjar, who was both guide and friendly advisor to whom, and his staff, we are greatly indebted for many attentions which rendered our journey agreeable.

All the way we travelled either along the cleared route of the railway or along the main road in main lines, excepting only a portion between the settle and Pedro and Mopoto. We went from the former to the latter by the route of Pauls Alferino and came from the latter to Mopoto, passing by the river and the valley of this city, stream, in which there has been no water for several years.

Having examined the maps and profiles I have seen substantially, the entire line of the railway as located.

The location. The location of the line has been made with care and intelligent judgment. I have on my person a sketch referred to the last 30 kilometers. The early pioneers who established the route between Pernambuco and the upper San Francisco, seem to have suggested a very general route. This was the basis for Mr. Xerjar's preliminary sketches for the line of the railway. Of course many local improvements have been effected in the final location of the railway line. I am satisfied that Pernambuco is the point.

The excavation and embankments as far as they are finished have been well made. They form a good bed for a first class metre-gauge and at some future day, it seemed advisable to use a wider track could be laid upon it. They continue for some distance, the metre gauge 1/4, the metre gauge 1/2, and that it need not be changed to any other gauge.

The masonry of the Culverts, beyond the first ten kilometers, is of a less costly character, and more approximate to the region than that near Pernambuco. If it were not near we had an opportunity of much skill in proportion to their quality, but these were constructed with the main feature of the railway, an of minor importance.

Along the route at a number of points I saw water-pits, the Chief Engineer had caused the excavated to store up rain water for the laborers and animals engaged in the works, which I presume were necessary for construction of the railway.

The rains and thunders which have occurred in June and a part of July, of this year, have had no effect in restoring water to the streams between the railway line. They are all perfect, dry, and have been dry for a long time, it is said that there has been no flow of water in the river for three years.

Water. Water. Great, constant, meteorological success of all the regions we have traversed from Pernambuco to this point. The crops, the groves, and some permit any soil, as my friend, Mr. Candac, and for part of water, not culturable or like cultivation. There is there an abundant supply of water, where many are similar. The rains, but for corn, maize, rice, cotton, etc., the main in the valley, on the low, hand; and the the upper part of the mountain that may exist along the margins of the streams between Pernambuco and Brazil. Cattle, hens, farms, pasture in the savannah, and milk and a little butter and some cheese are made, but there is no intention for a class of regular farmers to attempt a living in the region described.

Superintendence and direction of the works. The Assistant engineers on the line are all intelligent and educated men, men, Brazilians, and they appear to be in charge of and active in the performance of their engineering duties. I have been well impressed with the manner in which the work generally has been conducted by them, under the instruction...
The former Natives of the Country have been well trained in undertaking the Labours of the best advantage that the circumstances admitted of. Until quite recently they had no animals, and all the hunting out of the deep-cut, had to be done by men with hand-carts. They are only now beginning to use animals. Considering the fact that the work had to be done under such disadvantage I was greatly surprised at the amount of work which has been done on the deepest Cut-off, and near Belo de Agua. I judge that it is two thirds done, and it was only begun in January.

The road, for the convenience of the railway construction, has been well located, and is well adapted to its intended purpose. On a regular portion of the route it is good enough for thirty \\

Cargoes of heavy Cargoes or Waggons: but there are places, crossing the rocky valleys, where the grade is exceedingly considerable, where the progress of a heavy Cargoes would be more slow and difficult. I should

advocate that our main route, where the Cattle-

pound is not first class and where the Pasture is

poor, there at thirty or forty rods. In a tedious and difficult

task, to get the steam launch along.

The Chief Engineer had given directions to have the road uniform, and to have men at work

in places straightening and otherwise improving it. For the regular railway purposes, it is a very good road throughout.

It was to me unthought of to see how well the good

general line is adapted to furnish good roads, with little

more with than the clearing off the Sorne scrub land here and there — some prairies are there.

As regards the use of a steam launch drawing one

metre and a third, which ought to be able at least

15 miles per hour in the best places. The opinion is that

it cannot run at the present time; but I do not depend

on this opinion; and as soon as we can get Cannons, I will have a sounding taken first

between the river and Jafova, about 3 leagues, and

afterwards as we work up the river, and I will commu-
nicate the result to Chief Engineer Kreige.

At Jafova there is a river nothing whereby

excepting the town of the Ingenious Station, and

as Roanina, and here it is only a little better. But for the Cattle, which range back from the immortal moun valley, the people, when not stay in the river slopes, are almost perfectly barren, and the more of the river bottom are nearly cultivated, but in high water there are floods, and yet people do manage to live here and very hard.

some have a good crop of children. The Indian at the Paulo Affonso falls, the principal

inhabitant and guide, has lost Children. The looks of the drought, and now he has 100

I apprehend that it will be tedious, coming up

against the current with such large barks, proven as Cape Commando. I can judge better

after being what kind of Caucuses we get, and

after we transform them into boats.

In case there is depth of water for the Paulo

Affonso I would greatly rejoice if you could over-

take us and Nen and us in further progress up the river.

The stream at Jafova, and here, is wide

and beautiful, many half a mile, and the river

bottom and sloping as a distance from shining

pictures; but when the river falls, then beauti-

fule are away, and nothing the slum, entirely de-

~

The natural harbour of the rocky river fronti-

age Jafova, is a favorable point for connecting the

Railway with the river. At 20 low straights the

were in from 6 to 7 metres deep, and the face of the

rock bluff above stands about 5 metres above the present

low water surface, the river runs about 30 metres in

high water from 6 to 7 metres deep, and forms a natural

channel from 6 to 7 metres deep, and forms a natural

channel from 6 to 7 metres deep, and forms a natural

channel from 6 to 7 metres deep, and forms a natural

channel from 6 to 7 metres deep, and forms a natural

channel from 6 to 7 metres deep, and forms a natural

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channel from 6 to 7 metres deep, and forms a natural
Friday Aug. 29. Atalaia, etc!

I awoke this morning about 6; with a
pleasant feeling of stuffed head which I
attributed to sleeping on a bumpy bed, and
some hard stuffing, and some water under
my tires, as I ate a moderate breakfast (and I had
walked around a little before breakfast).

The residence of our troops here, The Board, which acts as an office and a dormitory is a
vacant house, a Barrack, and the Fireman, whose duties are to act as our Medical
I decided the residence of the day
when not in consultation with the Naval
Doctor and the Naval Officers; about which
I shall now come here to report a my long
letter to the Minister...[partial].

460. Our host, a neighbor, José Manuel de Sousa
who told us about a medium sized Canoe a
few miles below, has just been to see me and
has a canoe in it, and that from the
message he thinks it under sail be suitable for
purposes of taking on the Rio de Janeiro; so I suggest we
must wait till we get the canoe from above.

I wished that measurement of the width
of the river should be taken as the place to day by
the methods, wall for the purpose of knowing the
width, and to test the instruments, and it gave
the young engineer practice.

S. P. M.

I have felt uncomfortable all day; with a painful
stuffed head; and in the morning four bad nightmares,
about midnight I took a dose of offening from the
Pyretic Saline (Porosh & Soda) which helped a little
to clear my head.
Saturday, Aug. 30th. Atalha.

At the friendly Casa of Jose Pinto de Souza on Camp. Last night I arrived early. I was quite uneasy most of the night. I was frequently awak and became a quiet sleep, and my head did not feel comfortable. After being up some time in the morning and writing the Blazon Vol. II., I again took another dose of the Pyrethrum Saline. I do not yet (an hour after) feel much effect from it. My head is still aches; my hands are aches, as yet.

Breakfast at about 10, just previous, I took a second dose of Pyrethrum Saline, which, with the breakfast, moderate in amount, seemed to relieve my head considerably.

At 11, I concluded to make a personal examination of the Cacheira Verzea Rodonha - about a league below Atalha. Dr. Moises da Costa our Torim did not.

Cacheira Verzea Rodonha. Dr. Moises.

This is about the 51st League of M. Halfeld's, which he calls Cacheira da Vargem Rodonha.

M. Halkeld's Map of these Rapids (of Falls as it might be called in high water) is on a small scale and conveys a very inadequate idea of the place as it appear now, when the water is within 2 Paens (320 says Dr. Jose Pinto de Souza, our guide this day) of the lower stage, 18 inches above its home low water.

The rapids from the upper end of the Kep which run across the river nearly at right angles to the former once as the foot of steep, water below 400 feet, near a mile. The river was within half a mile wide above the rapids and quite like in high water along all sides of the rapids narrowing below along the rocky wall on the Bahia side or right bank. The river forms a small fall on the left side of the rapids, which continues to a fine small eddy, forming a well for any vessels that can navigate the river above the Falls of Paulo Affonso, the way to Satuba, the upper terminus of the railway here under Construction.

The river channel above these Rapids is in the

Bahia Side. (Through there is another Channel for Light Canoes down near the middle of the river to low water, as it is now.

M. Halfeld gives no sounding or current rates at this place, nor very below this.

There seems to be a channel in M. Halfeld's Maps about here. Sheet No. 26 ends at Leaque 312 1/2, about Sheet No. 27 begins at 339 1/3.

* Missing - According to this.

At all events, there are no soundings or current rates given on any of M. Halfeld's Maps that I have, I have given the Leaque 314, above the Cacheira da Vargem Rodonha to hear of any has about Leaque 339 1/2, a distance of 18 1/2 leagues.

I understand that this point da Vargem Rodonha has been considered as the lower end of the Uppers San Francisca, but it has been very difficult to embark and disembark, although the Canoes can run down as far as Gafara, but have come work to get up through the swift water near the foot of the rapids and also at the head on the Bahia Side. This when Captain Bostin made his interesting journey, and made his notice to the Uppers San Francisco, as the hospitable Casa of Sen. Jose Pinto de Souza.

This rapids, for a Kilometer, or more in length, cover two swift falls in low water, one at the head A. The other at the foot, B. The one at the foot is wider and forms a good landing, although it seems to be at the head is swift and much narrower, though it has ample depth.

A straight pleasure launch of S or 51 ft. would gain entrance to it. But at the upper end pitch of the falls they would have to land and get the Canoes past.

The only approach from the Bahia Side is narrow, not more than 25 ft. from the side.
Sunday Aug 31st 1879

Atalha, Pernambuco.

Sello Exmo. Comandador

João Nilo da Matta, Director General.

Rio da Janeiro.

Your Excellency,

Date August 9th 1879 received here to-day a despatch from the C.C. de Janeiro dated July 31st, amounting to 130.14 Fr. of the item of materials with red pig not promised to be paid by the Government.

Before leaving Rio de Janeiro, I was the Commission seen to understand that the expenses of the Commission, including provisions, were to be paid by the Government.

My predecessor, intimate to carry out the instructions received from Comandador Mauá,

My purpose is to conform to the Customs of the Government. Is it the Custom to allow a diario on such an expedition to the Engineer in chief?

I have heard the diario of the other members of the Commission will be as follows:

Pernambuco Ingenieure 1st Cl. Eng. 7.
2nd Class Eng. 5.

Another Bill together with the original Bill.

I enclose herewith the Bill. In accordance with the mark in red on the original bill. As all the articles were ordered through Don James, supposed to be for Government account. There is no way of determining precisely what portion of the items marked here belongs in the bill. I have assumed it at one-half.

I trust that my actions will be regarded as satisfactory.
Sunday Aug 21, 1879—Atalho.

Commenced or Letter to Minuta Simunza.

I close this, in order to take advantage of an opportunity of sending letters to Piranhos by the hands of Sen. Cavalcante, Eng., who is to-day bringing letters to us from Rio de Janeiro. Among them are ones from Commander M. dos Santos Matlly, believing our bill, for domestic coal, which I am sure to pay when the order to remain with the highest respect.


Left before my letter was sent ten days, and since then has been by another Person.

Atalho, Pn. de Pern.

Aug 21, 1879.

W. M. B., Eng., on the ship.


Secretary to the

Commander

This morning, I completed my letter to the Minister (which is to have the honor to address receipts), the messenger, sent by Chief Eng.,Nunes, from Piranhos, U. S. S. Cassan to me, on the morning that he had sent another letter with the authority to bring or forward Clubs and get them there. I will not ask the first time of these, or of the men, because I am going to present them next time. My general plan is to send one of my men with a man and a guard of the river, both French, and to buy Clares, any where along the river, if found of good quality, and send them down to meet us.

I have seen from the afternoon messenger that there are Clares along the river, and that they are

To-day, some small Clares have arrived for the first time on this point of the river. Some our arrival, I may have you to the river.

My general plan is to send one of my men with a man and a guard of the river, both French, and to buy Clares, any where along the river, if found of good quality, and send them down to meet us.

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To-day, some small Clares have arrived for the first time on this point of the river. Some our arrival, I may have you to the river.
Continuation of letter to Sr. Olivar.

After the wagon shall have delivered the things as far as we can, either here or to Cimarron, bring the things up a pond and immediately to finish them up.

The days are uneasy, but the nights are cool, so that in the tents we find ourselves a necessity. It shows many fine trees, and many larger ones. But to our surprise, our friend José María de la Vega says that he has seen here, at night, and that they don't know how to use them.

I had some carved wood in Aranjuez, when they told us quite a different story, and recently I found two men who knew how to carve, and I have something to explain to myself about.

I would greatly appreciate hearing from the Commandante or the Commandery of N. C. Guemes, and for the immediate notification of the Government, the Commandery has already been received. I had not thought to communicate this matter in the same letter, but I suggest that you be informed that the Commandery in Seville shall be informed by the Government on this subject, as I am not aware whether it has been informed. I have made two or three letters to this same, and I have encamped with this letter.

Perhaps some of the articles may have been struck out of the list which you had in your order, should be at the cost of the Government. However, the original list amounting to 3690 to 3692 is preserved in the notation of the Marquis de la Vega.

Whether the Government Caracas allows an agent of Carmen, to Mr. James numbers, or wishes to have instructions and conform to the government rules, on behalf of the Commandery.

Under the advice of Chief Sigfrid Stroem, in did not take soldiers, but employed
My dear Sir:  

Senhor Cavalcante arrived this morning with officers and newspaper from Rio de Janeiro, and a number of letters introducing to parties up the river, which he has kindly forwarded. We feel under many obligations to him. His engagement on the line prevents him from remaining long enough to carry on letter with him.

Just when we were assuring the letters received, your messenger came in from Cabo Frio, with letters addressed to our friend Senhor Ventura; but he could give us no information about Canos. He seems to have acted simply as a messenger. Under the circumstances we thought it justifiable to open the letter, which are dated in the 25th. Though not yet time until this morning the 31st.

In substance they tell us that there are no public Canos there, and evidently they will do nothing till some with authority is asked to go there. They may or may not be Canos there at this time. I enclose the letter to Senhor Ventura, with an apology for opening them. You will of course see there contents. I regard it as not sending one of the engineers up the river to procure Canos when he can. The messenger says there are Canos about a point about 12 leagues from here.

I also think it engaging great amount of sending the river with our things in that way. We can send the books from Jacoble, unless we can even get a couple of Canos or send stuff amount.

We have heard nothing of the Paulo Affonso, and nothing very definite about the leaguer.

I have examined the rapids of Remurde between here and Pato de Fuca, and note that over the rocks, and I have no doubt that the Paulo Affonso could get a few miles above the head waters of last year which I supposed was a low season.

When I see the other rivers, I shall be able to judge what the chance is for her going up the river, when the water rises at the State. Hoping ever to hear of the arrival of the board, and looking to get Canos.

Canes the honor to remain very respectfully,

W. Mcgirt Roberts
Eng. in Chief

Letter to Mr. Som. Ventura Jorge Martins,
Paraná,

The Messenger who took letter to Cabo Frio, returned this morning bringing two letters addressed to you; but he could not tell us anything positive about what was Jack or done about Canos.

Under the circumstances, and believing that the letter might relate to the Canos on the State of openimg them; being as we understand done under orders or military circumstances, and in case from them that no Canos were there and that no definite arrangement has been made, and that in the first hand some one the We Mann is to get Canos.

Thanking you for your kind attention I remain with the highest honor to remain etc., W. M. R. in chief.
Letter to O. J. James, 1879.
My dear Col:

This morning the
Hydraulic Commission received an official from
Comandante Vicenç de Matheu's
Director Obras Públicas; declaring
that more than two thirds of the
bill in made and which was
sent by you on the 31st July, could
be allowed to be paid by the Government;
merging all the other articles in this
allowance.

Accordingly, I have had made
out a new bill of the allowed articles,
comprising 1.500,— which I am sure,
along with the original bill to Don Matheu,
will be also sent to St. Paul's, together
with the other subjects.

I don't know enough about these
matters to judge how it will end
but it looks as though we will have to
pay a Considerable part of the cost.

Can I be paid by the Government?
Can we pay for another
next year?

The bill has gone down and
I am working on my tape by the light
of the candles.

I have so many letters to write that I must hurry to write,
Do not mention any thing about
this proceeding, but give—— in order
worry her for nothing.

We got no private letter but
newspaper to the 10th. Came to St. Paul
weeks as before for the present.

With much respect
Frais de Vina;

N. Milner Roberts

P.S. I have one letter to Dir. you addressed for Eduardo de
Sousa (Engenheiro) but I have not yet
received any of them. Please send it if you
have it. I cannot forward it.

Letter to D. Monde de N. Ave.
Adm o o Coron
Estrada de Ferro de Paulo Affonso
Pirankas,

Dear Sir;

Your letter
Adio August 29th. Came the
morning with letter corresponded
by the hands of Senor Cavalcante.
We could not wait for another
letter to go with him, and are
sent them by another.

Your mistake in opening
the office address to me, was
quite natural and it was
nothing of any feeling properly
around that it was entirely accidental, other

The members of the Company
with myself are all glad to hear
from you, and join in sending
Heard regards to yourself also
the other gentlemen in Piranha.

With much respect
Yours truly,

N. Milner Roberts.
Sao Paulo:

Dear Sir,

Your letter dated 14th July came to hand bringing a letter from the government requiring immediate attention, and I have no time to glance at it now and get an idea of your wish, before the mail goes.

It is possible that your pamphlet is among a large quantity of books and pamphlets which I intended bringing with me to read during my travels along this river. Our bag is badly here and partly, in the way as soon as I can have opportunity, I will write giving attention to your study; but perhaps I may not be in time to answer your present purpose.

The subject seems to be an important one, and not having seen the place, I could form a reliable opinion without a careful study of your pamphlet.

I regret that I did not receive your letter before leaving Rio de Janeiro.

I have the honor to remain very respectfully yours,

W. M. Milner Roberts

Condurung Letter to Sir O. C. James

The President has been kind enough to look through your letter and I have concluded that it is better to acknowledge it first, then a better collection of reading the pamphlet. I am afraid it is left behind at Dar es Salaam, with others, and I hope to send the strong copy back.

Pleas read on the back and forward to him. "May never appear, and Monsieur...

Sunday, Aug 31. At Alcaia.


Wrote from 9 A.M. till 10 P.M.

Senor. Cavalier was kind enough to leave with me letters of introduction to persons of the town, as follows:

Boa Vista: Marqueses (Rigulia & Company) M. de S. Soula e D. Boa Vista.

Villa de Petrolina: Antonio F. de Azevedo.


Brandao: Ant. de Francisco da Costa.

Vila de Corraco: Ant. J. de Andrade.


Today, Senor. Lisbon and Sabra paint in a Carrois, with our friendly host, Marques de Sais, an expert and canoe-man (as the angler), for a distance especially the point or quay of Iman, between the river and Caminho da Barca. They report on the width of 30 or more meters between the rocks, and some depth with strong current, perhaps 5 miles an hour, in the middle channel. They went down to the foot of the quays below the foot of the Elephant, and returned up stream through the smaller, a Carrois Channel, near the middle of the river.

I propose to make a final personal examination of the river tomorrow; it will require only a little time in the morning to send off the Corraco or other, or mail to Corraco, and arrange for some one to be sent to the river to buy Carrois.

About 8 A.M. sent off our courier “Andreada” on foot, with our mail for Piranhas enclosed in one package addressed to Chief Whiger.

Sent a man a short way up the river to get from Cazan that would not sell—would not want for 1200 reis day. A small canoe.

Although Mr. Darby, who wished to “geological” across the river, to him the Cazan; and the Mau, if he can get him, temporarily.

So day, Mr. Weems and myself went in a canoe with our friend, de Souza, and one of our men, who did the working (pulling, chiefs) under the direction of de Souza. The Channel is past on this side, if then trend, across toward the Bahia side as roughly sketched on p. 26.

The water is about 2 1/2 Palms, say 21 inches above the extreme low water of 1598. Soon with this much less depth in the river above the rapids. I think the Paula Affonso would ascend it through my boat.

The current is between 5 and 6 miles an hour through a Channel more than 50 metres wide and not badly curved.

At this time it is certain, a low stage of the river, the Paula Affonso would run up easily.

Mr. de Souza says that the Caz. da Itacura is less difficult than the one through of the same general character.

We descended the river opposite Car vao and 4½ Miles on the Channel, and about 2 feet of water over the large bay, nearest to the Bahia side. In low water some of it in bags. There is another bay below on the Pernambuco side. The Channel plain between these two bays. We worked our Canoe back on the Bahia side, stopping and waiting until the high bottom, the highest is not plated, but 150 feet. Water runs up about 5 feet when in the high waters, and not down tonight.

Rough approximation.


From Halfard’s Map from Jatoba


Caz. da Vargem Redonda. L. 314. at lower end of the rapids. Our examination show that this channel offers no serious obstruction to ascending steamers or canoes, or canoes in low water. Mr. Weems and I went through it today. How it may be in high water, as yet I can not infer, that the rapid area of ragged, beach rocks, on which the river will then rage, will make very rough water; though it now was running smooth enough water through the Channel for steamers and perhaps good enough for descending floating fargans and Canoes, now navigated.

Above this rapid as good navigation to L. 310

Opp. As pa. da Souza—will current at reverse point as follows: per hour. 2.05, 2.57, 2.45. 2.67, 2.25, near S. L. Opp. Aspa da Souza

Caz. da Itacura at or near L. 309½

3.04, 2.67, at 309 L. A 0.75.

Good navigation from 309 L. Up to 307 L. at Papagaio—Serra do Papagaio = 2 L.

Good navigation from 307 L. to 299 L. 2 1/2 L.

Just below 305 L. (Condeza = current 2.05).

Other currents beginning near 307 L. 2.05, 0.55, 0.47, 0.67, 0.53, 1.57, near S. B. 209 L.

Caz. clo Varg. at League 298 3/4

# Here between 296 3/4 and 298 1/2 there are serious difficulties in the river, which will re-qual beneath 298 1/2. Missão de São João Baptista de Rodeira in the Bahia side.
Special Study: The Situation.

I am here, with a large party, which was selected and equipped in view of navigating up stream, on the river, with a steamer, which could carry the party and large canoes laden with the baggage.

It is obvious to me that the steamer is not likely to be here in time to be a service to me during the present low water season. If I wait till she can get here, she could go but a little way up (suffering the rains to be navigable for her) before the annual rising of the river, and possibly she may not reach here before the rains may have begun.

In the absence of a steamer,

I propose, of taking large canoes, and with boards making them into boats, and training four men to row or propel them, or, if there is land, canoes, and thus going upon the information that large canoes could readily be had, that it was common for them of the Californians, that they could easily navigate this large river. I believe the canoes would be here very soon after we could get here from Pircanas with pack trains, and that they were in the habit of using sails here as they do in the lower river.

This information is erroneous. I am to say quite uncertain whether we can get any large canoes brought down or whether they can be here, and when here, the canoes may become too heavy to use, and we might make some use of sails with the help of a few men from below who know how to use sails, but even with sails, we cannot, in many places, make headway against the current. I find already on the Falls of Redwood, a strong current than any known by Mr. Halphen--namely, between 5 and 6 miles an hour. The steam launch can steam away, but canoes deeply laden, even with a good wind, may not be able to do it, and they will have to be worked with more or less in the fashion to which the canoes men along the point of the river are accustomed, namely, pushing and pulling in the eddies and corolling them around the swift current, along its edges.

Two or three men, lightly equipped, might ascend the river at a reasonable rate of speed; but this large party, with 12 men as a guard (to labor it is true also when necessary), and 5 men sent up from Pircanas, now make our whole party 12 + 5 + 12 = 29 men. We have two double canoes of large size, and one double canoe of small size, with crew, 12 men. On each of the large ones and 4 in the small one. According to Mr. Krieger, we should have 40 men -- which, without any baggage, would be at least 8 tons. But cutting off 20 these, there would still be 34, which would encourage the canoes; and adding the baggage, instruments, and provisions, the canoes would be to carry laden that their progress would be very slow; and I would anticipate that we should have to put off the men (all except the hands working the double canoes) at every salute, and possibly we might at some of them be obliged to lighten the baggage.

We should of course be obliged to encamp for there, in any case; unless we had large canoes, large enough to make sleeping room for 34 persons.

I will now consider what kind of examination of the
Never could be made under such circumstances.

Soundings could occasionally be taken, but only occasionally, because it would be useless to take soundings when the boats would be lost. The circumstances mentioned next to the time by the caddies, or cordelling along the edges of the channels.

No regular system of soundings could be taken continuously in the channels. The course of the stream, observations of the shore, forests, bar, barns, bluffs, hills, mountains, etc. could be made by the engineers on the boats, and Mr. Hall's maps used and made permanent.

The section of the river, which however, would only be needed at considerable intervals, along the river, would have to be made with compass of moderate size, which would have to be taken along with the double compass for that special purpose, and which might perhaps be used in making some soundings by running down stream through the channels, forcing them up again in the usual way.

Meanwhile there would be nothing for the 12 men to expect to assist in setting up the tents and in striking them and camping them on land again excepting that they might aid in cordelling the boats up the swift water places, and perhaps aide in running. This guard seems to be deemed a necessity. At all events, I dare not, with my ignorance of the ways of the people along this valley, many of whom have been great sufferers, for recent years, undertake to dispense with it.

It is useless to refer to how I would have arranged this expedition had I been informed in time of the circumstances and the object in view, and allowed to plan it from the beginning.

The problem is, with the engineer and two men and horses on hand, and with what we are likely to command in a reasonable time, stay within a week or two days in the way of river craft. What is the best mode of accomplishing the most day during the ensuing two months, and two and half months of uphill movement?

The main point is, to ascertain the low water depth of the channels at the rapids — as many as we can during the short season remaining; the rates of the currents at those places, and, to note what can be done to improve them, especially at those deemed most difficult; all other things become secondary.

1. How to do this most expeditiously is the prime question.

2. One plan is to divide the force. Myself and the smaller part to go ahead, rapidly, on land; selecting certain rapids for my special personal examination — these deemed to be the most difficult. The other force to work their way up the river, examining as rapidly as they can advance with the boats, the other rapids — also taking in the matter of the canoes I may have examined, but not stopping for such purpose.
4. Another plan is for about half the party to proceed by land the other half by water to arrive at the boat, and all rendezvous together very night. Each party making such examination as it may.

5. There is known another element in the problem: it may be important that as soon as possible we should know whether at any rapids within twenty or thirty leagues, the water is too low to proceed the ascent of the Cachoeira. From which Manuel de Souza says, and from the number of channels shown on Mr. Halliday's map that there be a place may exist at the Cachoeira de Varg, or the 29th. Leagues, or 16 leagues of the river above here but not more than 12 leagues by the direct road.

This evening to decide to proceed further. To once in person accompanied by Senhor, Dona de Souza, and Senhor (M. Desprius) to look at that particular Cachoeira sufficiently to ascertain the certainty (if any way) or the doubt as the case may be, so that can communicate the result to M. Kruygh with such suggestions as I may feel warranted to offer in connection with the launch Paulo Affonso.

The carpenters, who is also a foot-hand until 1879.

Accompany us, and one man with a pack mule, we have arranged to start at 9 A.M. tomorrow to be gone 3 days. Though it may be 4.

Meanwhile Mr. Wegier will remain in command at Atalhos and attend to all matters. From write.

End of Present - Dept.

Some Remarks - General
Tuesday, Sept. 2.

Tuesday, Sept. 2. - Continued.

**PAPOGAIA**

Mass of terragona, haynes - fantastic. Union Peak, R.I. Coming Red Sandstone rock. In riding down the vase Casella we pass one castle looking rock with a natural window in it, and near by, on the right, another very picturesque cliff. Red Island from rock.

Casella opp. at 2 P.M. - We halt at Pappagao Mountain. Calling it 4 leagues from Alcalto.

We had a fine view of the river from here below as it sweeps around to the right, and with a high plateau beyond, the hidden to the right of the Bahia side. By the river the old is called (not very distinctly) from eight leagues. Whelp calls 9 leagues (about 3 leagues far). Salbasa - above here, where we went to stop tonight. Manoel de Ibarra calls 3 leagues. He says it is the river - Sand and along the river from here to it.

Now, Amaranth was here last night - left at 6 this morning. He arranged, or spoke about 2 Canoes over here, the other two lines above here. Manoel, Victorino, the proprietors here (with the usual abundance of children and servants) says they are only 30 Palms long - any about 20 feet. [Small Canoe.]

We send our man here with Cotonum, and Con-Cleon to come in dinner and eat here, and ride the 3 Canoes afterward. A clear navigation below as far as I can see for the bend.

The Red Sandstone Rocks here have a peculiar aspect. Manoel de Ibarra says that Tigers formerly inhabited some of the caves. He also says that a few years ago or high binnacles of the rock, were in the action of the rain falls, with a quiet torrent like a earth quake.

The most picturesque view of the ending of this rocky ridge cannot be seen from my room, though the beach is the river front in my improving. Thursday.

Casella.

Sabbata next above here, where we went to stop tonight. Manoel de Ibarra calls 3 leagues. He says it is the river - Sand and along the river from here to it.

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The most picturesque view of the ending of this rocky ridge cannot be seen from my room, though the beach is the river front in my improving. Thursday.
Wednesday. Sept. 3—cont’d

Yesterday and to-day after fishing the river, we find the soil quite different from the hard gravelly and sandy soil below Stahlos. It is a clayey alluvium, which needs a lot of water to keep fertile.

The river itself which contains a tremendous amount of water affords a most beautiful scene to fish up against any large plantation. The banks which tower front two stories of the 16 acres give a scene that can’t be equalled. Those lands at the rear are generally a little higher than the hill, and mostly of second growth; the densest of which is probably for about half a mile back to where the land is level and open. With these young oaks, cedars, and eliptical trees, these high cottonwoods make grand forests without irrigation.

I have been to lay a letter about the 298-league block—6 leagues above Stahlos.

There are two small coves on the opp. side of the San Antonio island. One near the entrance 25 ft. inside of the bar.

Salt is made by boiling the water in such a way to make it brine, which is then boiled down to form the salt. The salt is used for many purposes, including as a preservative for food and as a fertilizer for crops. It is also used in medicine, agriculture, and industry.

The Channel is confirmed to close 20 ft. wide, when there is 3 or 4 ft. below the bar of channel. It is 5 or 6 ft. deep. For rainwater it is 3 to 4 ft.

We still have cattle and arrange to feed the animals. They make salt here out of the brine—about 2000 lbs. a day to make the salt.

The stream is not clean like many of ours, but it’s better to take the salt out of the river. One horse is much like another, our family like another, and the land is all level with a good level, sand, gravel, grass, or low water.
Wed, Sept. 3. Cont\(^2\) Cachoeira do Vão.

I conclude to go across this arm of the River to the foot of the Scapeable Island--which is just above this Peninsula--and walk up a hill near the Cachoeira de Vão.

Mrs. Amarante, Porto De Sampa and I went up by the young man. We walked up on this hill at 10 a.m., the elevation of the hill is near that of the highest flowers. It is not all run down, and most of it one is a slight depth. It is a splendid plan for engraving in rising form. There is ample abundance of water poor to throw up all that might be wanted for polishing a magnificent form.

We row on to a canoe from Dr. Recorde's magnificent Caravela Tree, on the river back to the point of the Island. We start at 3.20 and arrive at the Fall of Vão at 3.35 with my little canoe.

We stopped 1/2 mile from the island and lost at large gradual bay, which is filled up with gravelly inlets. The channel on the side which the monster is back enough for the launch--but not deep enough to lose water.

3.55 at the Falls--A regular line of irregular line of a route, lying N 75\(^\circ\) 40---about 900 to 1,000 p. m. length. The route at about the north end about 700 (about 800) the distance on 500 p. m. above low water. At this time, the Paulo Affonso Corteirans pass this falls astern. There are many little channels, but only the new for Canoes to pass. It is close on the island side, about 5/2 mile with a depth of 21 feet 20. 4. (2 1/2 1/2--10 1/2) and the lands on the island which--the water would close the little channel, and the water over the little and then from the rocks on each side of her. In long water it will be much more. She does not reach this falls.
The young man who came with us says that this arm of the river can be traced in October—confirmed by an officer named de Souza.

There is now a large body of water flowing in a deep arm of the river; but it is subject to heavy rains, floods, and storms. This river has caused more than 20 little channels, or fells, within 500 of the channel found to connect to the island a large volume of water, which has a nearly vertical fall over the rock dean of 92 feet, and a current cannot safely pass through.

If this arm of the river were to be the size selected for improvement, the plan of this fall or fells would be to build a series of dams, which, if not used for the water, could be used for other purposes. At the same time, the bed of the river, which is usually covered with debris and mud, would be cleared to make it suitable for navigation.

There are two places—one near the middle and one near the island, to be chosen for this purpose. At the same time, the basin below and the river above must be improved, or the work here would be much more expensive.

Every means being prepared before hand, the work should be done in August, and both a moderate force of American labor would do it all in that time or less.

I see plainly, however, that more work is required than I was inclined to assume when I examined the upper parts this morning.

The Bahia side of the river must be carefully examined next, as there must be a large body of water above, or it might be

#2. Our point of new settlers I must state that the Paulos do not consent to pass the next winter.
27 Thursday Sept 4. Sorobábe, Pajendá
Fernambuco

Had the best sleep I have had in the field. Awoke about 5, but did not rise till 6:30 when was movement in the house. Our canoes have come across the river from the Bahia side, and is ready for us. The river here, I think, as a full half mile wide, just below the island Sorobae, and far enough wide up and down it is a beautiful stream.

Our canoe is 54 palms = 38 feet long. It is a very heavy, clumsy thing, but we could make it go, even with another like it, as an arrow.

Cachoeira de Vêo, Sept 3rd - Cont'd

Below the lowermost of these falls, the stream takes a turn on the way from Sorobae - 24 miles as or so as good as the navigation within a few miles of Pernambuco. No work is required in this portion of the river.

The presence, however, of seven or more large falls on the left shore, and on the main stream, that it is impracticable for men, to take the canoes up past these Cachoeiras, and the evidence is clear that the level of the river has gone up at least 2 palms, which in this case would make it materially worse.

I judged it as barely practicable to get up with a loaded canoe; or to carry large canoes. A large canoe here is about 35 to 40 ft, long, 2 ft wide and drawing a foot to 15 inches wide.

From the river going down the river with this canoe, but they talk about being 3 or 4 days, and I cannot bear the thought of my time in that, to be in such use, and turn homeward with an animal.

B. 08. Aft, canoes - get out and walk on the river banks, black, semi-fishing rocks to the first bare falls when the water is high about 6 ft in 400 yards to time made, forming half eddies. I think a Cachoeira Stream here. 6 years up 5000 or 6000. Lesser than Jordan, a mile long, up, in the upturn of these two bare falls which fall about 4 ft in 200 yards.

Annex at Upper Falls.

-Bahia-Side Channel-

A. Pitchin 3 1/2 in. - more 2 1/2 ft when full
B. 4 3/4 ft 100 Cami: millbury the river
C. 3 1/2 ft. 200 - is the place I am inclined to believe to make a short cut navigation 30 years 2 1/2 time at lower falls at 9 1/2 ft.

At the lower falls, I am inclined to adopt a similar general plan - to reck the main flow for the low water Channel, and to construct it with large falls with stone (of which abundance of the right kind at first here) on the left side. Where there is not sufficient a minor channel to the top. Four feet might have to be blown out in order to complete this low water Channel.

I lean the lower falls as 9 3/25.

Returned to the Canoe at 10, 2 and start homeward at 10. 15 with a ferry, strong wind against. High water mark of 1879, at the mouth is 1 10 12 feet from the water. It was a low flood. Canoes began to come in March. The whole width of the river on ground (main body) is probably a mile wide in a pool. I think it is not over 1000 or 1200 yards wide, and was not 40 ft in breadth. May 25th, 1879, I stop here. We turn to 2 canoe with the current at 12 14 - at 10 13 here then be.
The letter is changed in page 79.

Don't forget to change the date on the letter to April 18th, 1854. After sending that parcel, got back to our old place of residence, for we are planning on moving to California to join the rush of prospectors looking for gold.

The government, if they are to carry on the transportation of goods to Jutaba, will need a reliable system of transportation. I suggest building a railway to connect the two cities, where it will be able to arrive safely and efficiently.

I am not yet prepared to make any final suggestions in regard to the kind of steamboat to be used. I think the upper San Francisco River, if properly prepared, could be used. The American models of light-weight steamboats, built for navigation, would be the most suitable for the river above this place.

I am inclined to think that the American models of light-weight steamboats, if properly designed, will be the most advantageous. Such a steamer can carry 120 tons of freight without drawing more than 3 feet of water; a boat about 100 feet long, 40 feet wide, and 20 feet deep, which would cost less to build and run on the Ohio River, would cost than $15,000 complete. I think I could have a request for a study to be prepared, taken apart, and reassembled at a cost of $15,000.

I believe that such a steamboat could be built together with a railroad at a total cost of $25,000 in less than one year after giving the order.

The launch Paulo Affonso has a capacity not at all well adapted to the Upper San Francisco...
Thursday Sept 4 - Cont - from Page 77 - in the River

We went on to Shine on the plac, about 1/4 mile above our
home - took at 10.30 - at 11.05 we arrive - pag 1/2 mile
in 41 minutes.

We then breakfasted, examined the pins and pins of
giving down more with the canoe, and decided not to go.
Ordered the boats to be made ready for a start. God
Kozy and Manoel de Sousa will make their trip 20th
morning - (Sorobate) (meaning well prepared)
Sorobate: Dom. Ant. de Regondes.

1. P. M. start - from Sorobate for Cunamata
- 2 miles but we stop 15 minutes for each animal.

2. 05 - Corps the dry bed of Rapae River - farther down
there we dropped a canoe - Plantation lane
which is on the end of the road - Cunamata - Straight
south, mule - - Travelling along here again
4.00 - Saluda Stop - Stop and get a good drink of
new water. Here we have crossed the big
2nd ford and are on the river bank again -
for several miles we have a good wind -
the Alluvial - Alluvial, high bottom.

10.35 - Corps the dry bed of a smaller river - God friend
with the same washed down.

5.00 - Stop at house on river bank where Don
Amarante had made some arrangement about
2 canoes - We went to the river and saw
the canoe. It is a fine Medium canoe, for this
run - 27 ft long - 8.5 Palm long about 2 ft.

9.00 - About a mile or so below the canoe we
stop for the night at: Cunamata - The same
place we stopped at on the night of the 2nd inst.
on our way up. Compared with some ill sea
on our hands above here, these people are quiet
Civilians.

We can see the Sapagaia Mountain from here
very distinctly leaving 8.55 E. - we think slightly
westward. It is beginning to be heavy in the
north below this is the night. It first rains here coming
gently to the left, - then almost about 10 E. (I)r
and then closer head is the wind on a heavy bend.

AM.
5.45 Start for Cunamata - Cold but not icy - Cloudy -
which brings on rain - not heavy - Umbrella up.

5.20 Dry small rain

7.20 - Cunamata - We pass without stopping - Some sudden
here, with canoes going & prominent Cormorants.

7.30 - Cunamata - We pass without stopping - Some sudden
here, with canoes going & prominent Cormorants.

7.45 - 1st Sunday of Sapagaia Mr. Piter Homarone
Now, hands up with Mr. from a mill.

7.55 - Main Sarmatia, about 2 leagues for Sorobate. -
Now, hands up with Mr. from a mill.

8.30 - We strike the road leading into Caximbra (a
place with the reservoir within in sight on our first
day out from Atalho.

8.37 - We reach the house, and delight at the invitation of Senhor

9.00 - Our Pack-train (Consisting of one with grey horse)
arrived in charge of Maricel - Carpentier & Co.
for this day. Here we are to breakfast and rest.

The rain has ceased, and the friendly cloud has
hit the head of the river. It is my pleasant here.

I have omitted mentioning it - I will now mention
that during our trip of nearly 14 days, in very heavy rains, we
saw the inhabitants there - one, but generally live ba-
bies, from 2 to 3 years old - always perfectly naked - night
and day - - all have long, dirty, and dirty legs con-
trasted with the length of body - And all are dirty all over.
Washing seems to be relegated to some safer day.
Friday Sept. 5.—Caximba

A queer prairie engineeringley about 200 ft. in length at the end is about 5 ft. higher than the remainder of the embankment. The water levels flow out over the natural surface at 5 ft. before it winds into the top of the Llano front. The upper 15 ft. of the high face (or rather 5 ft.) is brick or brimstone, and beyond 5 ft. as low as at S. But they collect a considerable body of clear water. At present the stream here where they get water is about 15 ft. below the bottom of the valley. They follow as close as the arroyo goes on. They say that they have never been without water for the animals.

The reservoir seems to be all that renders this place habitable at present. All the farming that is possible is on the bottom of it, where the water has evaporated (and perhaps some water has leaped away) and become lost to them. The main dependence is the rent for cattle pasturing and the reservoir of water. Farming is not undertaken it is not done, nor any where they that I have seen.

When the Sun Shines out Cleanly Clouds the evaporation is very great.

At 8 o'clock this morning the very unique Miss Egyptian gypsy girl (in finery) that was in the window in Churril St. Philadelphia—attaching the figure of the fat-skinned man—eyes hairy, complexion—figure—there are two such here, who if they were cleaned and handsomely dressed until he really, beautifully, notwithstanding their other complexion—industry.

Our own law here is a shoemaker—a good pair of slippers Kid Skin Shoes $1.800—excellent lace large go on. $1.800. They don't seem to value their time as any thing.

We left Caximba at 12:33. Arrived at the summit of the range, along the broken curvy road over grading varying from 1 to 5 per cent—smooth, regular surfaced lime long and straight. A charming bed for a real road—on both sides of it—very I call it a leque and about to the summit from Caximba—than below them on the side road for Manuel de Saguia. Takes off for Made at 2:53. Before to his home he calls to leagues. I BROUGHT 3 leagues from Caximba to de Saguia. We arrived Saguia at our ENCAMPMENT at 3:30 P.M.

I sent Sen. Cavalcante here with letter from Mr. Sanger, Dr. Lenham & Mr. Lathrop from Sanger & the Sena Cavalcante to ask us up the river.

We deine at 4 P.M.

After dinner I proceed to answer the letters— and hand them around in English & Sen. Elion to the Portuguese at 6 P.M.

The news is that the War with the Boers and other things are at Old Agua. 3 leagues out from Piranhas only on the 3rd. last. Having started this the 1st instant from Piranhas.

Sr. Hesule (Ceylon), Comandante da Silveira, Sabato. (Answer) Chief of Secto. Paulo Affonso, Raimundo. (Answer)
Telegram to Comandador D. Leão de Oliveira, Secretaria, Altho Sept. 5, 1879

I have carefully examined a portion of the Cachoeira do Vão, and respectfully report that the launch Cândido pass there until the annual rise of the river in November. She cannot aid us in ascending the river this season.

Lettce, Altho Sept. 5, 1879

Comandador D. Leão de Oliveira, Secretaria, Altho, Sept. 5, 1879

I send you herewith the above telegram to Chief Eng. Augusto at Divrigi requesting him to have it forwarded to the first opportunity. I returned the evening from a fruitless hunt for the Cachoeira do Vão and the other Cachoeiras in that vicinity, which I examined during the past two days in search of Cimarens. I am fully satisfied that it is entirely impracticable to land the launch in any of these falls since it is until the annual rise in November.

The water is still between 2 1/2 paces above extreme low water, and gradually falling so that it is due becoming wrong for a boat of the kind of the Cachoeira de Paulo Affonso. She is not safe to navigate the Uruoca from San Francisco. [With the river improving, the mast-advantage boat will be something made for the model of the Ohio river, or Upper Columbia river light draught steamboat.]
Continuation of letter to Com. Dr. Plinio.

Without some explanation the statement that the Launch (drawing 14½ ft) cannot pass the Cachoeira do Vão at this stage of the river might convey the impression that there is not water enough flowing down these falls to create a navigable depth of 14½ ft. But it is not so.

There is a abundance of water to make a navigation more than that depth but it will require some labor for several months and my examinations are not yet complete enough at this point (see Sheet 25 of Halsted's report) to enable me to determine exactly how the improvements shall be planned.

I went ahead to keep pace as quickly as possible, whether the launch once be passed, and also to make a preliminary examination of a small ferry vessel on which M. Halsted and C. Krauss, both engineers, pronounce the most difficult on the Upper San Francisco.

I am now glad to know that they pronounced it. That is, I am pleased to think that there is more work above it, because I believe that a navigable channel can be made more easily and cheaper than a small ferry which can only be used without a large expense otherwise, but I must examine farther. The difficulties are confined chiefly to a leakage in length. I recommend the channels on both sides of the mouth. The Bahia side, where the largest amount of the water is not used by all the canoes navigating this part of the river, they are free from the Bahia side to the town on the Pernambuco side.

Either side can be made into a steamboat channel.

I am still at a loss for proper canoes, Donor Amarante is with the new engaging Canoes. I saw two yesterday that he had engaged - the large one was to start yesterday afternoon. It was 15 leagues above here in the river. And it ended 300 days getting here. It was a blow of time.

These canoes are made by allowing the natives to carve the canoe and many of the canoes are made in the style of the natives, others are made from the river.

For the programme, by taking a small party, I hope to finish the work of the Canoes to the other end of the river and look at a point in the way, having the principal survey and the Chief of Seca and I hope to follow up with some more practical examinations of the difficult places. In this way we may accomplish something.

The Canoe movement along this part of the Upper San Francisco river is slow. In fact there is no movement of Canoes going on the river now, and even I scarcely know that.

The facilities that I have seen in all other cases, are not here at all. I understand that things are better higher up the river.

The Cotton is better above the point, but it is only along the puri and for some miles above it, where it is only 16 leagues above here that I have every rain hand, enough for their own consumption.

Concerning this, however, I will write more particularly hereafter. Sen. Cavalcante is here, he is right and will take this in the morning. In its way he is marked by Mr. Rodrigo who has been here. I believe gone over to the east side, but the circumstances of the many and of the wind are daily against rapid movement. My bid. We are all well.

* This cotton has capabilities — to be referred to elsewhere.
On the 3d, visit the wagons with boards, and other things was cut, at Chao de Aigua, in its way to Sa Sepulcro. I mention the men of the Conoon have come, and came to be along. We think they can do it until we can get more Conoon here to carry the party.

My experience from this time will prepare me to be an Operator in Connection with another season's operations along the river, as the more going about it. This will be something gained.

Then the horses to remain with the highest persons.

On the morning of Sept. 6th, sent Capt. Cavalcante back, then Colarreti, together with me to O.C. James and Mrs. M. R. Langdon.

Sr. Amarante's first Conoon came back on the morning of the 6th, and in the evening the other Conoon. He came also, but returned in the afternoon to get 2 more Conoons to Leagues River.

Great Conoon with the 2d Conoon, where Sr. Amarante had engaged.

Sept. 6th 1879.
Caxá da Safelina - 150 000 M. Current 4.5s M. Current 30 to 40 P. depth.

280 3/4
VILLA de CABRÓBO - Spanish town on a minor branch 1/2 a league above the town end of the Island of Assumpta. # 283 L.

280 4
VILLA de PAMBANO (Supremode) on Bahia Side.

281 1/4
Caxá de Pedra de Moleque (near middle of the Main Street).

281
Caxá naia Middie of Main Street (no name).

280 1/4
Caxá de Carangue - town end of island of Calabouco. Numerous small islands. How far? The Main I'll Assembly and Bahia.

280
Caxá de Maria.

279 1/4
Upper end of large island of Assumpta. The party on Serrate comes to the town half mile above island.

278 3/4
Caxá de Esapeia (Caleas) near town end of Ilha de Aracapu.

278 1/3
Caxá da Incorova - town end of Ilha de Boi.

277 1/4
The channel runs off from the main stream along the oblique head of Ilha de Aracapu to the middle of the stream. These islands run across the valley. See Sheet 23.

277 10/4
There are two Caxás shown, opp. 1. cas Almas about 26 1/2 miles. Also on See Sheet 22 MAP.
Opp. end of Serra das Carabalas no. Do OROCO

276 L. Caxa da Barra - near here.

From 3/4 Mr. abw 276 L. Channel turns west among many islands toward the Bahia shore - along which line it continues for several leagues, with various depth, and a most binding of P. from 20 m to 70 P.

275-4 Caxa de Caracas - Mathada de Cachorro.

These numerous small islands are surrounded by 3 considerable ones - "A Cola" near the P. from 1 de ás de Santo Maria man Bahia side, and 1 Grande between and above the two. See Sheet 22.

275+ Caxa da Villa - Bahia side.

274-4 Fagundes. Opp. thi, the river has changed off 1/4 only from the near, when it takes off, and curves to the S.E. of Ubas. The channel of however on the P. side, Caracas, is about 274 1/2 L. Opp. following the road that runs off from the river about 274 1/2 L. We come to 2 leagues away from the river - coming to it again at 270 L.

Villa da Boa Vista - W. 268 1/2 L. This puts Boa Vista about 130 miles (43 1/2 leagues) above here, Apros.

Allowing that I traveled along the road 3 leagues per day, including examination, it would take me 18 days - stay 2 weeks to reach Boa Vista.

3 1/4 L. 246 1/2 L. Now look up Joaizeiro - 22 Leagues above Boa Vista.

From Boa Vista to Joaizeiro - 22 Leagues. I covered 23 days, on horse back, or perhaps in a boat or barge in the same time - though no road is given. About 18 L.

259 L. From Joaizeiro up to Cachoeira do Sobradinho, is most of the distance, plain fencing on the river - or should be, according to the map. About 1 L. 239 - only 7 1/2 leagues above Joaizeiro. In 2 days more, on the river, in 14 days, and allowing 1 day in Boa Vista and 1 day in Joaizeiro - 21 days = 3 weeks.

That is, according to the 9. Sept. would be at Sobradinho rapids - with my predecessor, notes in my book - by the 1st Oct. ready in two or three days to return - or to keep up the river, as may seem most advisable. * This was not the case - we did not leave Apros till the 15 Sept. and we reached Boa Vista Oct. 8th.

Villa de Xiquixeque. on the right bank of the Ypeoera about 1/3 league above its mouth, at the head of the very large Ilha do Micado e - and about Opp. 179 L. or 60 Leagues above Sobradinho rapids =

179 L. Villa de Xiquixeque, Bahia side.

Xiquixeque is not in the Rum S. Francisco, but it is connected with it by a navigable Channel for boats and large canoes about a league in length. It has also another outlet by a navigable branch along the Ilha do Micado e, which joins the S. Francisco about 2 1/2 to 3 leagues below the head of the Island. The land between the Villa de Xiquixeque and the main river is called Ilha de Calabresa. I presume therefore that there is another Connection between the Ypeoera and the Ilha de Calabresa.

167 1/2 L. Villa da Barra do Rio Grande, at its mouth.

Opp. the 1a de Laranjal.
RIO GRANDE. 167¼ Leagues, is [179-les 167½] 1¼ Leagues above Ajuda.

126.6 L. Villa do Uruubi - on the right bank of the right hand channel of the Ilha do Uruubi - the main town stands a half mile from the river. I presume owing to the ground being subject to overflow in floods.

110.80 L. Sur Bom Jesus da Lapa - on the right bank of the river, on a sort of arm, or bay - (Capitão na Pedra Calada - freg.) Fazenda, same name on left bank of river - 8 mi. N. of Bahia.

87 L. Villa da Caracanha - on left bank of river - opp. island of same name - nearly one league below the Rio Caracanha - which forms the boundary between BAHIA and MINAS.

80.4 L. The Rio Verde Grande - enters on the right bank - it from the boundary between BAHIA and MINAS.

The river above this point is entirely within the Province of Minas.

74½ L. N.ª S.ª da Conceição de Morroinhos Pedra Calada (dismantled)

67 L. Jacaré - a village on the left bank - in Minas

56.6 L. Porto de Brejo de Salgaço - [villa de Jurujara] stands about a league off on same side - left bank of the river

53¼ L. N.ª S.ª da Conceição das Pedras de Maria da Cruz - on the right bank.

24¾ L. Mouth of Rio Paracatu - in Minas a large tributary - sounding shown 2 leagues up.

5 L. Mouth of RIO DAS VELHAS or Junction of the two rivers. A large bar in the Rio das Velhas at its mouth. Above, in the Map, the S. Franceses appear the larger - but no sounding are given except for about 8 mi. above the mouth.

Now are sounding given on the Rio Das Velhas above.

0 Pirapora - Cachoeira da Pirapora.

The Rio das Velhas is mapped; 7 leagues up to Roca do Capitão Hippolito.

These memorandums made from Halley's map for preparing to arrangements new programme to suit the Circumstance - the Commander's Hydriatica being absent in an awkward situation, and doing scarcely anything yet.
Mr. Halfeld's measurements of the Das Velhas and S. Francisco, give
the close:-

For the Das Velhas, $1/159$ cubic palms per second = 7.43 Palms per
minute 3.09 Palms per second
549.640 C. P. in an hour = 1005 Palms per minute
3.14 P. Per square yard Vol.

Before the Junction
The whole R. S. Francisco = 31,652 C. Palms per second

P.S. Mr. Halfeld says (Page 54) that the river in front of the do - 6000 palms =
250,000 cubic palms per second. 5,465 palms per second, 1,482 per hour. 24
Palms above ordinary level in 1783 - and 82 Palms in 1792.

Mr. Halfeld estimated cost Pirespom to Sobradinho = $36,354
and mean $26.30 39.60. 64. 52. 55. 61. 67. 68
99. 77. 78. 79. 80. 81. 96. 97. 107. 108. 114. 119. 123
124. 126. 128. 137. 142. 162. 144. 82. 159. 186. 192. 196. 285 x
10. 4000 x
24,000. 3

Marginal: Sobradinho to Jaraes. 152 Rosa Vite

Her total estimate including interest = 1,970: 000 000

Page 10


July 5, 1879 - from St. 18.


And now for the Crofton's famous steam engine.

Then, of course, I say it again...
Sunday Sept. 7th, 1879.

Continuation of letter to Chiefbags Kruger.

Dear Sir,

I have just been looking through the letter from Chiefbags Kruger, and was interested to learn that you had seen him and that he had written to you.

I understand that you are planning to make a trip to the interior of the country, and I am sure that you will find it a most interesting and rewarding experience.

I am enclosing a copy of a letter that I wrote to Chiefbags Kruger, in which I express my appreciation of his hospitality and good cheer.

I hope that you will have a pleasant and successful trip, and that you will bring back many pleasant memories.

Yours sincerely,

W. M. R. Smith
Monday Sept. 8, Continued.

This barge is said to have cost $3000.00

than new. It is no longer new. It is very

heavy and slow and leaky, too. I doubt

whether it would suit our work on this

part of the river. I will find out what we

make up in the way of a journey out your

Canoes.

We had to send 4 leagues to the woods
to get timber for our oars and masts. The

oars are made, will made by an two

Carpenters. They are excellent workmen.

I now think I send you about half

grave, or some 90 dollars of it

on pack animals to Curralinho, to

light our boats, unless the barge

that is here will agree to take it off

the time for us at a lower rate.

The usual charge from here is $3.00

per pack animal, or $3.33 per animal.

We also paid $3.00 per pack, per

wage, for provisions, for day 80 miles, by

the road. [About 93 miles by river.]

Our instruments, oars, etc.,

came this morning on the pack

animals I have sent after them.

They report that the league with

boats will reach Jadoble tomorrow

morning or the next morning.

I am pleased with interest the admira

able paper of Thomas Garcez

Paranhos Montenegro 1875

A Provinceu a Navigação do Rio

São Francisco.
Counting up stream.

Banco d'Areia - Rapids.

Pavella - Rapids. 2 channels - last seen on the one on left side.


Pambi - Rapids.

Pambi village - Capim Grosse 30 Houses.

Moleques - Rapids.

Indian village.

Chapels - Our Lady of the Assumption.

Cachao de Cima - Rapids.

Portao - Rapids. Called very dangerous. Pass going down an # Cabboto.

Island 5 leagues long. Assumption Church.

Betina Channel between Side.

Mocós - Rapids.

Quite broken.

Jimbaranas - Rapids. A little Foul water. Narrow channel but 2 large rocks.

277 1/2 Paz. do Aracapia (Island)

Chapels - Juizes. Same name.

S. Miguel on its R. S. Felix on the Left.

Almas - Rapids.

Almada - Rapids.

From league 276 1/2 completed.

268 1/2. 550 Pop. BOA VISTA. Permanence Side.

Reference on 3rd Sheet of Translation. 5 Steamer "Salvador Marminho" came in at 1875, Came down to Boa Vista and back.

Below Boa Vista. The river was rendered so navigable except by canoes.

Igreja Nova.

Built by Lady, Mother of the (Him) Superior Commander. Old one on 1. Santa Maria & I. de Figueiro.

Cachao Rapids. Sant' Anna.
Counting up Stream.

Sobradinho Rapids. 5 kilometers below Sant'Anna.

Cachoeira do Vão to Boa Vista is called 30 Leagues.

Krauss Estimate Cost (30L) $425,000

It is considered by Halford practically useless, nor from Pará to Sant'Anna is it Sobradinho - 2,400 L. = 720 miles.

In any case, his estimate is put at $335,000.

Low water May to Oct. The Rapids, Sobradinho are an obstacle to free navigation; best in high water, the current is the difficulty.

Pilot and support.

Halford went up and down with large boat "Princesa do Rio" Sobradinho.

Halford's Estimate:
390,000 dollars
460,000 dollars
690,000 dollars

Krauss Estimate Sobradinho 55,000 dollars

Boa Vista 295,000 dollars.

Halford makes his estimate from Boa Vista to Cachoeira do Vão = 30 Leagues, whereas Krauss estimates $425,000. Making a navigation in low water for boats, drawing 25 inches (3 palms).

Krauss' Estimate based on depth for boats of 25-27 inches below Boa Vista.

P. S. There is such a navigation now in the lowest stages except the Vão below.
Since making my personal examination of the
most difficult parts of this river on the recent
occasion, namely, the Cacheira do Vale and others
covering a league in length at that place.
Noting the general characteristics of the stream
for a distance of a hundred kilometers, measur-
ing the volume of its low and water flow here;
and after studying the reports and maps of
Engineer Halfeld, and Kraus, as well as the
graphic description of Captain de Lima,
and the excellent paper of Senator Figueroa
and President de Portugal (published in 1850),
I conceive that from my long familiarity with the
phenomena of large rivers, I can make a
intelligent judge respecting the size and extent of the
additional information needed, and also of the
best way to obtain it in the shortest time.

I deem it a pleasing duty, in behalf of an
abreast gentleman, whom I have had the honor
to know, Civil Engineer Halfeld, who traversed
this river in 1852-53 and 54, and when reports
and maps were kindly placed in my hands by
the City of New York, by His Excellency Mr. Gorges, the
Brazilian Minister to the United States, to say
that they contain a large amount of valuable
information, which must have been of great
advantage to succeeding explorers, and which
I am now sure will be of great service to this
Commission, during much time, and enabling
us to comprehend the main features of the river
more clearly, and much sooner, and at less cost
than would have been possible without these
important aids.

I make this statement now, because it has been
intimated, by different persons, that the data ex-
hibited by Engineer Halfeld are maps were largely
handy on the map, and that there were the opportuni-
ties of

* I am not able to determine exactly what is or is not to be
mentioned in this report. I have been informed by my correspondents
that the Falls of Paulo de Silveiro appear to be substantially the same as
those of the previous season, only.

True, Mr. Halfeld's maps are not complete; they appear to be
imperfectly reduced, especially the plan of the falls; however, with the
improvement in this respect, the report of the Commission for the
preliminary examination of the river was finished.

I now believe that, with the aid of the engineers and
agents of Engineer Halfeld, and the new data, the
report of the Commission will be more complete.

The Commission may be able to arrange all the important
points, to the upper end of the river, during the
short period remaining of the present season.

All of the observers have been along the
Upper San Francisco and others in stating that the
risings and fallings of the river are
leagues is 239 leagues and the upper limit
of the river is 239 leagues and the
from the lower limit of the river, or 239 leagues.

Pirapora, the river is already a fair steamboat
navigation, meeting only comparatively, falling costs
by the removal of the few natural obstructions to perfect it.

Hence the Commission succeeds in accomplishing
the necessary low-water examination before
the annual rise reaches Sobradinho, the main object
will be to prevent the river from rising during this season. Unless
the annual rise should be unusually early or later, it may get
considerably further rise. It is important that I know
the upper limit of the river, or as much of it as
possible, this year.

First importance, is the study of the stream in its low
stage. The observation of it in a medicated or ordi-
ary boat, on the highest, say in November and perhaps
early of December. Then there is to be done on my return.
Circumstances have caused us to modify our
original programme; and perhaps to do so again.
Our measurement of the low water flow of the river, at Alcalde, made Sept. 5th, 1879, after deduction to the assumed loss of extreme low water, gave 60,780 cubic metres, or 2,150,396 cubic feet per minute.

This will fill a channel 2.71 feet wide, 20 feet deep, having a velocity of 4.75 miles an hour. This is very large for the low water flow, and ordinarily, excepting in December and October, it is much more on the part of the river.

In 1852, Mr. Halford measured the low water flow of the San Francisco at the junction of the Rio de Velhas, including both streams, and found it to be 19,140 cubic metres, or 677,176 cubic feet per minute.

That is, a little over one third of the quantity found here, 942 miles below the point of measurement.

Even then, at the upper end, or 942 miles, the quantity, forming a channel 181 feet wide, 10 feet deep, having a velocity of 4.75 miles an hour.

These dimensions are quite ready to convey a practical idea of the volume of the flow.

From the measurements it is clear that there is, at all times, an abundance of water, and during more than three fourths of the year a deep abundance for an excellent channel or navigation if it be advantageously, directed into proper channels. At the same time, this is but insignificant in amount.

According to the above, two thirds of the present low water flow passing over the Delta Offshore falls from the tributaries below the Rio de Velhas; and as nothing whatever at this time from these upper tributaries is furnished by the upper streams, coming below the Rio de Velhas, the upper tributaries are therefore radically different from more below in a most important particular. While the lower tributaries are dry most of the time, and can furnish any supply when the river needs it, the upper tributaries never cease to flow and they are the same time according to the quantity in the main stream.

Of course this difference in the vital characteristics of the upper and lower tributaries involves a radical difference in the characteristics of their respective valleys, which must materially affect their relative productive value. This is true now.

The large quantity of water in the Upper San Francisco on its low stage has a very important bearing upon its future improvement. The engineer not being confounded by a narrow gorge of supply, in many of the rivers along the Atlantic coast in the United States, the Ohio, for example the entire low water flow becomes my drone. Between the mouths of the Allegheny and Monongahela rivers, at Pittsburgh, Pennsylvania, is 96 miles a long it's mouth. The San Francisco at the junction with the Rio de Velhas is 942 miles above the falls of Puello Offshore. They have nearly the same length between the points mentioned.

But the lower water flow in the San Francisco At the Rio de Velhas junction, is 942 times greater than the low water flow of the Ohio at Pittsburgh.

On the Monongahela river, one of the two great tributaries which form the Ohio, the low water flow was found to be 86,000 cusecs, and also constructed a regular system of locks and dams (1895), which has ever since been in successful use; and at this time the government of the United States is constructing an experimental lock and dam on the Ohio just below Pittsburg.

If the low water flow on the Ohio can do it on the Upper San Francisco, I would not have proposed locks and dams for the Ohio.
Chains, if they are the same in width, and at the same distance apart;

distances which interfere with it and which when removed will have a clear channel of sufficient width and depth to accommodate a large steamboat.

Beyond the rapids, (although in plans of the Rio de la Plata and

or 196, 132. Cun. ish per minute, while that of

3595 Cun. per minute, or 480, 991 Cun. per second, is

2 1/2 times greater, as that of the water.

The navigation of the Upper San Francisco between Piriápolis and Sadoleta, can be improved to some extent through the rapids, which steamboats properly constructed to stem strong currents, can pass up and down. What the cost will be I do not yet know.

The cost of improving the rapids will depend considerably upon the depth and width that may be determined upon for the improved channel, and which are not yet known. This opinion can be formed respecting this point after an examination of the principal rapids between the Cachachue and the Sierra Nevada.

To arrive at the most judicious dimensions (depth and width) of the improved channel, some reference may be made not only to the present state of the principal rapids of the valley, and of the Contribuyentes Valley.

It is, however, obvious, that upon the fourth of the length there is now a good steamboat navigation, needing only the removal of

few facts, and

is usual, among engineers, to receive a license like the foregoing, to be presented only in

the official report, to be made after the conclusion of the season's work, but it is to me more satisfactory, and if it has been my custom for some years past, it

furnished, the facts and nothing more, as the more acquired, to the parties interested in knowing them. Of course it is always possible that further examinations

and other may lead to their an opinion of new.

I do not hesitate to say that the improvement of the Upper San Francisco appears to me to be more feasible than I had anticipated before seeing it; and this judgment is based chiefly upon my preliminary examination of the Cachachue de Tres, which is owned by both of the Engineers, Halfeld, and Iturriaga, to be the most

transportable of any on the river, above here.

and a noble site. The facts to be gathered and disinterred. The agricultural and mineral resources, now lying dormant, may be even for more consequence than the estimation of that part of the river itself. Which seems to need to little to render it a fine navigation; which in fact seems to be already a fine navigation...
Tuesday, Sept. 9. Atalho.

A warm day. Spent most of it writing a very long and official letter to Commodore, Sept. 2. Luis Hector de Hesban — See 6 preceding pages for a (near) verbalem ditty, or epistolary ditty.

I also began an Office to Sir. Almirante, P. Enzo. Modifying my letter a commotion had begun but not being satisfied with the shape of it, I regimn it till tomorrow.

We have been in negotiation with the owner of the Cargoes who is here to take about 800 another gran ship with Cabo de Bari 31 leagues from it or 6,700 per cargo — or 1,300 per cargo, and we are arranging the division, or so, to take about the same quantity on our behalf. When we get them fixed, we will have first rate canvas made; but they have been so very stiff lately.

Also arranged to send one Carvox after bound to Jaffná, hoping they may be there to night or tomorrow morning.

I am also arranging to make a small land party to go as far as Cabo de Bari — myself, 1 Ingenio, M. Dibrary, 1 Corv. 1 figaro, and 1 man to attain 3 pack animals. 6 persons and 9 animals.

Sext. 10, at Atalho 2,500 to Sir. Almirante 16 00 to White Bear 100 to Devil.

Wednesday, Sept. 10th. Atalho.

Engaged most of the day writing and copying letter. Made writing instructions of Augr., 1879.

See pages 111 to 116. Indicate for copy.

Heard that we had to buy 2,500 per Cargo for Cargos where we considered it to be only 1,500.

We are now getting 2,000 per mile of a Car of 1,100 — un garrigue and from brother's at, but that until nothing ar the inner thiefs unless otherwise said.

Our Carvox which left this morning at 6 allots, for Jaffná. Came back at 4 this evening, with 140 boxes (aprox 72), which I saw with enthusiasm for our Carvox. The boxes are Cedar of the Circus, — corn lighter than just about 9 1/2 ft x 4 1/2 ft. 9 to 10 ft with 4 1/4 to 7 1/4. These 140 boxes weigh day 1000 lbs. with 3 men and 500 lbs. = 1500 each the Carvox about 7 inches thicker — leaving about 8 inches more of water.

Our Carvox are here by 1st shipment. Order large request Carvox, they have to take it from Commodore, Coor. Notice.
This morning, in presence of Sr. Sabria, I handed to Sr. Amarante two packages of money, Brazilian government notes.

1. Containing 1500$ 
2. Containing 1000$ 
3. Containing 2500$ 

This is part of the 4057$ I received from Captain Kruge in Piranhas. The 1554$ I have, and I am accountable for only 1554$.

Sr. Amarante is accountable for the above 2500$.

See page 117 for Sept. 10th Journal.
is only a part.

Generally, when a reach is not complicated or very difficult, the main feature can be seen, and for a without blocking the Canoe for the purpose.

At obstructions or bad rapids, time may be taken to get clear sketches. Accuracy is not expected, nor is it necessary, in the present preliminary examination, but it is desirable to have clear, clear, as the Chief difficulties are, and about the width and depths of the low water channels, as they exist, and the position, extent, and nature of the obstruction.

At the Cacheiro do Vão, and the other rapids, connected, the river, is not definitely fixed, and days may be required to get the needed information.

A course should be run, or as to get the face and distance (to be taken) from the low water side of the lower rapids, as the Pamambusse side of the Assarabé is seen, to a point just above the lower rapids; (about one league of leading) from of the position, etc., etc., for the purpose of marking that channel by the signal, to a point near the leading. The signals can be seen at the same time from the same steamer, and Canoe taken that are going to Cerebbo, the Sketches, and Maps. If two, can be joined near the beginning and ending. Benchmarks should be made and marked.

From the examining I made, my present impression is that the Steamboat Channel can be made at low cost, with an easy descent on the branches along the Pamambusse side. If not all the way from the head of Cerebbo, is as least from where the Canoe Channel now comes

or to the Pamambusse side from the main river. Of the low water, or long side, or large stones, however built, at the head of Cerebbo, can be made to face into the Steamboat Channel. The additional water needed—provided other things favor—that side for the Steamboat Channel.

When no doubt that a low water Steamboat navigation can be made through the main Channel, where all low water, there are two considerable falls, but it will probably be more easy, and have a more northern current than the others, or accounts of its length.

Jail is necessary to run the level along the Raccah side, to ascertain the profile of the river leaving. Where two points, or from a point, a fraction of a mile from just below the town to a point four or five hundred feet above the latter one; ordinary, with the level, the height can be given at a point about 20 meters below the same distance above each fall.

If there are other falls above, you can judge whether they should be levelled and not. Where there is no actual fall, and the current does not exceed about 5 miles an hour.

No leveling need be done, except this point above designated along the Pamambusse side of this particular locality. Fewer or as much as these days until a town enough to get all the main features, as this place.

According to Hangle's statement, there is a depth of water from the main channel to a point just above the head of the Island of S. Miguel along the Steamboat Channel.

If the Steamboat Channel be made in that direction, it will probably be navigable for tide, a low voyage, along the main, along the Island of Jacumbas, in order to lead the water to the Pamambusse Channel, and also.
below that, to close the small channel between S. Miguel and S. Antonio Island, do as to
emanate all the water brought in from above
over to the one Pernambuco Channel.
Observe as much as you can respec-
ting these points.
The single small dam, resem-ble,
formed to have only to be about as high as,
only a little above the present surface of the
water to divert it. In some cases "Dow,"
built of rough timber, even flat with rough
stone, may be employed.

I have already been urged to com-
prend the general character of the obstacles
in the way of a good steamboat naviga-
tion on this coast.
When such occurs in any channel,
endeavor to be improved they must be
removed. True truth are wise.

The longer a channel can be made
through any point of rapids, the better; as
the velocity in a given distance is found
Corresponding, but if a point溺使
straight, Channel can be obtained with
being in some velocity, it may be
preferable. Experience, and judgment.
the little known question, when they arise.
Velocity over 4 or 6 miles an hour,
are objectionable— When former, steamers can
are not to be
encouraged, though proper steamers can
be made to.
The work required to
make a steamboat navigation on this
stream is chiefly at the rapids, and
knots.

1. The removal of obstructing rocks.

2. Closing cut and island channel, with
some small dam (up-up) of, in some cases,
with cattle placed with them, in order to
divert the flow of water into some channel
(Chanel), to prevent the water from being lost for the Channel.

3. Judgment, however, is required, in order
to ascertain which is the best route to be
selected for the improved steamboat Channel.

The cause of the simplicity of the works
required, is the very abundant supply of
flowing water in the river, at all times.

The quantity had been limited
to a small amount, as it is in many
streams. The cost of the improvement is
the good steamboat navigation which have
been much greater and the works more
complicated. In fact, if the river had no
greater flow in it, the grade, than the Ohio
river (in the United States) in its low stage,
it would not admit of a steamboat navigation.

Lower water existing, a mean of locks
and dams. The case of which, in this
Valley, would have been enormous.

After deducting the height from our
measurement of the 5. leagues. To allow
for the lowest depression in the stream at the
place, it still leaves 60, 816 Cubic meters per
minute or 2,146,300 Cubic feet.

Engineer Headford, in 1852, states, the
low water here just below the junction of the Rio
das Velhas (33 leagues above here) to be
15,140 Cubic meters, or 537,375 Cubic feet.

This is six times the low water flow-
head of the Ohio river, at Pitts-
burgh, Pennsylvania.
Sept. 11, 1879, Atalho.

Atalho Sept. 11, 1879

P. Reinado von Kruger, Eng. on Chope &
I learn that a man is to arrive in a few minutes for Paranáes and bring me more letters, if possible, from the other, please make sure.

We sent a Canoe to Guatí,

Barata, which brought us 140 out of the 72 freight, but we are probably expected any more. If there are any letters, I will send them to Capt. Fischer of Manaus de Souza.

We are busy getting the Canoe from.

There's perhaps being timber, we are obliged to come half of our Cargo by another Conveyance to Cabo. We expect to leave here within

or three days.

I am still here to remain

My wife, etc.

W. Minter Roberts
Eng. on Chope

Rec'd this morning from

Sr. Amarante $60,000

It being the Sum I let Rudolphy

The Steamer Engineers have

at Pernambuco

that a new

The owner of the Cargo here landed and that he is ready to load to-day, and

Start tomorrow for Cabo. Here, to

take up Cargo (91 Leagues) for 13,000 pesos.

I suppose about 80 Arrabacon

or send them that way.

Sr. Amarante, M. Beer & Co.

We return the largest Canoe to day

with William daily at a temporary

Capt. Paranáes. He working very well.
A mathematical formula: $v = \sqrt{2gh}$ gives the velocity of the projectile. A rough estimate of the range of the mortar rounds can be given by $R = \frac{v^2}{g}$.

$\text{Cachoeira do Corcovado}$
$\text{Paz da Canabravinhos}$
$\text{Passagem}$

$\text{de Rodellas}$
$\text{Arabicus e Serre}$
$\text{Arrivo}$

$\text{Cachoeira do Curuva}$
$\text{Fazenda do Barro}$
$\text{Fazenda da Canabravinhos}$
$\text{Jatobara do Cura}$

$\text{de Cabodó}$
$\text{de Fazenda}$
$\text{do Pombinhinhas}$
$\text{da Cachoeira}$

* R Fence, 14.2
  In 48 miles 14.2
  or 2.4

* In 15 miles (km 2.94 to 2.99) 18.7
  See page 120
Continuation of study of the Rapids from Embro to Chambly. 100+ Leagues
- Say 48 miles (fall say 1.49 = 3.15 ft. per mile).

Remarks.

Or the stern, stern-waist steamboat of light draught on the upper Allegheny flow (the largest confluent which forms the Ohio river at Pittsburgh), forty years ago ascended the stream when the fall was 4 fur. per mile: the water flowing over a gravelly bottom.

The stream being comparatively shallow, the velocity of the water was considerable, retarded by its passage over the gravelly bottom and sloping sides of the channel. The progress measured of the retardation from this cause was not ascertained. It would vary materially, with varying depths of water.

The actual amount of friction would increase with an increased depth of water, from five causes: namely, the greater weight of water, and the augmented velocity due to the effect of gravity, but the proportion of friction, compared with the increasing volume of the flow, would be less.

So much depends upon the character of the bottom and sides of channels, and the quantity of water passing through them, that it is not much difficult, but it is impossible to use any formula, without special reference to the particular case to be considered.

A formula may be made from experiment, in any size and any shape of canal, which will apply, under similar circumstances, but these are rare.

The circumstances at the rapids on the Upper San Francisco are the general characteristics of all rivers; bottoms and beds, sandy, muddy and irregular, but having various declivities and different widths and shapes. Any nothing short of observation and experiment at each rapids will give the depth and velocity at a given stage of the water in the river. Pressure and shape of the channel at each place, in connection with the depth and velocity, will give the character of the channel and indicate the nature of improvement needed to make it better, at that particular stage of the river.

At the first view, the natural impression would be, that the numerous rocky rapids in the Upper San Francisco, possess no redeeming features, that they are only unmitigated evils, and the sole obstacle to a good steamboat navigation. That if they were smoothed away to an inclined plane from Fort Ross to the sea, then would remain a perfect navigation.

Let me examine this point.

According to Engineer Harford...
the total fall is 17.11 feet in the distance of 1143 miles, or at the rate of 1.5 feet per mile. bottom takes way into a, the stream here had a smooth, regular declivity, 1.5 feet per mile; a given quantity of water would pass from the head waters to the sea in much shorter time than it does now because it would have a greater average velocity. The high water period would occur sooner, and the depth would be less during the lower water stage than it is here, (excepting certain falls and rapids) and when low water it would not rise as rapidly as the pools as it does now along the present course.

It is true that with a river of that inclination, having an abundant supply of water enough to give a depth of 5 feet for the low stage (with a somewhat bottom and sides an average velocity of about 3 miles an hour, while in a grand navigation.

But could it be so? This river has an average width of more than 2,000 feet for hundreds of miles. taking it 2,000 feet wide, and 5 feet deep floating at the rate of 3 miles an hour, what is the quantity of water required? 1,640,000 cubic feet per

At the present time there is little about the quantity now flowing at this point. coming at its head through a thousand miles of canyons, rapids, deep pools where its velocity is greatly checked.

In the case of the imaginary river that quantity of water would not be as great as in the sea at this time, as a much larger quantity would have flowed to the sea. (But again, it is to be considered that the San Francisco river is still generat, differing from most rivers, owing to the magnitude of its low water flow.

The continous channels through the country related, necessitate depth of the channel in the adobe, occupying a large portion of the width of the stream, necessitate depth in the channels. These circumstances, therefore, are not unmitigated evils, since they serve to maintain a deep navigation, and for a longer period.

9 P.M. Sept. 11th

Evaporation 1/3 inch in 2 hours from a bucket of water not very accurately taken from 1 1/2 to 3 1/2 P.M.
Sept. 12, Friday, Catalco. Journal.

Page 113 for my letter. This date to Sr. Jose Cordel, the Soares de Melo Avellanas at Cabrebo, sending to his Caw a Cargo for the Barge owned by Sen. Manuel Jose de Andrade.

I also sent the letter of petro-asturian written by Sr. Carvalcante.

I went down to our Carros several times to day, to assist at Manrique the manner of changing them to Ajojo. The Carpenters are doing it well.

I arranged to depenn with 2 of the guards Plant leaving at 12 o'clock, and, as arranged by M. Kruger, to come to M. Kruger as follows.

Letter to M. Kruger.

Sept. 12.

Our Carros will now be shipped out a cargo. We have sent by a barge which came down here, two hundred of our Carros to be deposited at Cabrero to do Sr. Don Carlos Jose Soares de Melo Avellanas, to whom I have a letter for another Carvalcante.

You got the news of the guard return to day to Pirahna, though there are still twelve, including the governor, which understand to be the number you had designated. I am willing to retain that number, but no longer, as there is scarcely any thing for them to do. I have allowed the two men to take with them one horse, and their gear can travel to these here. By this they must be able to get a new 2 days allowed for Americo and Francisco. We are hoping to get some mail before leaving, I have the help of Sr. Miguel Roberts.

Glacto, Province of Pernambuco, Brazil.

Sept. 12, 1874.

John Rogers Esq.
My dear friend,

Here we are, in excellent health and spirits, about 200 miles from the ocean, encamped on the left bank of the Upper San Francisco river about 1.5 from the main, on a boat of 800. We are making a few taoos into one and another canoe. I have the honor to submit the following as new, not found in previous publications.

The town, "Hunming," as above shortly described.

On our way from Pirahna, we turn at the head of good navigation as the lower San Francisco 10 miles from the sea, and where the river is about 200 feet wide. The river is wide, and navigable for 30 miles. We were over the line of the Passe Affonso Railway now under government construction.

It is 72 miles long; it has grade in one place, in getting up from the lower river valley to the general plane of the country, which is flat. Generally made by a large gauge 1 meter. There are about 2,000 miles of tracery engaged upon it, nearly as much being tracery from the interior of Pernambuco, and Carav, which has been so lately affording with strong, ferrous, staple and discipline, for several years past.

We turned off from the main road to our left to view the Great Hill of Passe Affonso. We arrived there early one afternoon, encamped, and remained until the following afternoon, when the region lies the next afternoon.

Here is one habitant there, a which dwells a Portuguese Indian, like it not what to eat that he has only two children; but as he is young, etc., speaks,
Sept. 12. Friday. Atalcho

Loco to Mr. Boggs.

The river was in its low stage, but not so, return lowest by about 18 inches; gave the quantity of the falls (aftermath measured by the main the most mile above) was enormous: over 2,500,000 cubic feet per minute. 2,500 x 140 1,000 per sec. x 30,000,000,000. 80,000,000,000.

The falls of Paulo affonso were named for the purpose of comparison with the Falls of Niagara, though they may have been formed about the same time, for everything known to the Contrary, the only record exists, except that the rocks and water only go back to 1895, when the water raised high it was a natural river, but in places the Emperor Dom Pedro. São Paulo visited. The chief object of the observation appears to be to determine the fact that the Shangriwa was by Engenheiro Carlos de Almeida. It was in 1869, gave birth to the river in the City of Piracuaba.

Leaving out this aberration, Nature has attended to reproduce on the river most faithfully, and a grand work has been produced. If I described it well, as an upper, with my eye in a fine fancy opening, thousands of large stones, covered with a film of grass and moss. The river is divided by rocky islands. Rocks, rocks, nothing but rocks and water. It cannot be a scene for those who have been to Niagara. But at the last, some people will compare them. The Emperor's constant opening is probable as good as can be done. After referring to both, from personal observation, he said they are different.

The river San Francisco is also different from any river I have studied. As yet I have seen a little less than one hundred miles of it, but the Falls, the Cachoeira do Lago, 45 to 50 miles above this place, and the rest difficult in the thousand miles, prepared to
Sept. 12. Friday.

At the offices of Mr. Boggs, I was introduced to Mrs. Boggs, and having with me the excellent maps of Hayle, the German Civil Engineer who surveyed this country in 1852, 1853 and 1854, I can present you with the general characteristics of the stream as the same are the way.

Numerous rough rocky rapids, with interlocking sloping banks, expose various velocities. Every portion of the stream above the upper terminus of the railway, can be passed by canoes and private barges.

The portion which is generally accessible, and is dangerous to rapids above Highland, at about 50 miles from the Upper one of the 2 rapids, covers about 16 miles. Aborn's steamer, which would have been afloat, had it not been for the rapids, was able to navigate, only half a mile from the river bank. The rapids, however, are too shallow for navigation. In fact, the course of the stream running on this part of the river,

The great characteristic and vital advantage of this stream is the abundant water, even when in its lowest stage. At the junction of the two valleys, the river, after the low water flows, is only 8 miles from the Ohio at St. Louis.

Not having yet seen the Missouri and upper portions of the Valley, I feel forced to offer any description.

The lower part of the valley, above the great falls, is peculiar, quite different from our American river valleys, and quite unlike other river valleys in Brazil.

The great annual rise of the river, 20 feet on the average, the marginal river slopes and keeps there a deposit of fertile alluvial deposit. These slopes, after the subsidence of the floods, are cultivated.

We are alive on one or the other side and some places, as in this vicinity of the river, on both sides. In a small way, raising vegetables, Chief, potatoes, and beans, with a little corn and cassava (m consistently). At frequent intervals, there are small elevations above the top of the river back, above the flood. They are composed of clay and cinders, with flood and rainwater, but no glacial and liable to wash. These are inhabited generally, each home has at least one man and woman and not less than five children, the older ones being, in general, in good health. The clay or cinders not having to much clothing, the clay climate being dry and warm; although the fact we have frequent the higher rains, and we have not encountered the feet of mosquitoes.

The high flats, which in a former time were formed by the river, are now for the most part above the highest floods; and many portions have a good soil, but in no instance, have ever been cultivated. They extend from a half mile to a mile or more before the land rises abruptly and then, as a rule on this part of the valley, the slope is very gentle. The flats are nearly bare of vegetation, the cypress, tall oaks, large pecan, and other trees, are sprouting, purifying of calcium carbonate. There are trees and large Cactuses, and they become the forest in diameter and depth. The river bank, a very extensive region, on both sides of the road, the Province of Uruguay, and on the left, near St. Louis in the right, and fortunately it affords some pasturage for cattle and sheep and horses.

There are houses in the Nester, but they are much like those along the river and inhabited by the same productive people. Although all flesh is grass, yet here there appeared to be crime.
Sept 12th

Cattle, sheep, and children being the property.

Now, while water is the characteristic of the river, thought is the preceding characteristic of the path of the valley. A large river where beds are perfectly dry, and which, owing to the arid climate, have been so for several years, Not a drop comes in from any tributary for a long distance above here. In the little valleys of the Slope's, Settlers, the proprietors of the Settlements (They are not plantations, neither are they farms.), Farming, as we understand it, is unknown. I am not whether there is a single one in all this past (As in any part) of the Valley.) No rain on earth means No Cattle come across water when it rains. A rainy season is one and ever due, but the rain does not always come. The herds gradually evaporate, and as they leave the valley, Cattle are a people. By and by, it disappears from the surface of the world—then they dig, and find water. It sinks gradually, lower, and the yellow down. As girls grow, let us times are their efforts become more, and they love their Cattle. They love milk and use to make cheese, but lately they have had to give the milk to refugees from the suffering regions farther in the interior.

The different farther off the river, because there the underbust are flow presently, and the towns are known to be important. The changes may be gradual—from the condition of enriching production how to better production farther up. Hence to see the

The water in the river for irrigation, now high soil. The new, down to the great valley, has an average fall of every foot for mile. Strong farmers blow less than 1/2 of a day's work with their pumps, and a large quantity of water; which, if raised at the upper end of the tract, could be utilized for the residence. For many of the flats on level of water must back them they are at the new level. The sky, and the climate, and the New land, are as bright and beautiful as they are. But the meteorology is odd, and only dependent for the region. By night, the stars and planets are shining, and Jupiter rising, are never brilliant. We have the moon for some time with her shining face and strange often and light from the planter's land, Geoffrey of the river's and the opposite shore. Its serenity lends enchantment to the fires, for when you go over there, there is the desert. The hills over there are steep. They are a new land and washed with deeper gullies.

We are all well - 37 of us all alive, perhaps 12 are arm of a man. I want to see without them, but they were anxious to take them. I am not more inclined to take the responsibility of doing so. They are part of the town. They have been friendly here. We ate an ox or two days.

The little may not be a made for some weeks, it cannot get to any American place before the end of Oct 5th.
Letter to Mr. Bogard,

I am looking for a mail to arrive sometime next Monday, or Tuesday, and I hope you will write soon. Later, I hope we may hear from you before Sunday, but I know that our regular mail will be Monday. Please give my kindest regards to Mr. Bogard and all of your family, and to all our friends on 10th E. 30th.

Very sincerely,
your friend,

W. M. Melvin Roberts

P.S. In the case of any letters — if there are

Things at home which you might be interested in, please write them to your discretion through our four Fosters, or otherwise.

Also.

Letter to W. M. Sandale

4 pages — Paula afferno — and Christmas with sketch of an apple — and if a house and these 3 from

Enclosing check for $100 (not 100) Pasha

Know my account

And Sept 13, 1879.

Mail arrived.

Two letters came from Richard, 1 from Cor. James, 1 from Mr. Knowles, 1 from Mr. Lucas, 1 from Mr. Wickham, Director Obras Publicas, and another from W. N. on 5th & 15th. Other letters for the Party—none for me from the United States.

The officers related to the case matters, examined with fragments of the桑德斯 correspondence, and Dr. Arrarante pronounced an answer stating that the case had been heard, and the list of names given, but that they could not prepare the case for him, as the papers are at Paranaas.

One of S's. letters relates to the arrival of the Edwardo Paulo Affonso, and to the consideration of the statement that the ration had been reduced, to the families of some of our men who had been engaged for us by Mr. Knowles, etc., and the other relates Chief of Navy—Cavalcante.

I have dated the 10th of the other day.

In the evening came a Special Messenger with a third letter from Mr. Knowles, Burns a 11th correspondence concerning the Edwardo Paulo Affonso. I have read, signed, and my official letter, known to the 10th, now add, and in the same order known to the 11th.

Copy of letter.

From S's.

To Raimundo da Silva, Eng. on Chef de Co., I have the honor to acknowledge the receipt of your letter dated Sept. 1.

I learn from it that the statement made here that you had concluded the actions is false.

I did not believe the statement, but it seems prudent that I should be assured of the facts by myself. I do not wish to change the arrangement you made with the Indian King of the guard.

I have written them for when your letter dated Sept. 11. came by special messenger.

Dr. Rodicio has not authorized me to employ a messenger of your, at all. I do not know whether any one who has the right authorized him to do so.

He is correct in saying that the work engaged at 50% of his authority, and his expenses to be charged. The suggestion of have made a turn on for your Consideration. In regard to the disposition of the
Sept. 13th. Sat. Atalho

1. Do employ the steamer (or engine, Kedestope) at some other wharf in Paramaribo, (if possible). If I am not willing to remain and be employed, I would communicate how he can be employed, and as aforesaid. I desire that you will send to Mr. Plenio in my name, a telegram as follows:


"Since telegraphing the conditions of the river, I have heard nothing further. In the absence of special instructions I advise Mr. Kriger to retain the steamer and further orders from the Government. We have commenced two ajaos. Tomorrow we move up the river, hoping to reach Cabraal in the month."

W. Miller Roberts

1st on Chefe.

I have the honor to remain,

W. Miller Roberts

My Ajaos Col.

Col. O. C. James

This amount to his of the -

The evaporation to day from a bucket of water at 10 a.m. to 4 p.m. was 1 1/4 oz. of an inch.

Most of the time hot. The surface of the lake was shaded by the rim of the bucket, and after 2 p.m. the evaporation was 0. I think the lake being only half full.
Sunday
Buenos Aires Sept. 14th

To Sir. Com. Pte...

After leaving here, our mail facilities will not be so good as you are here; though we have used our best efforts our mail on foot was never good before in two days between here and Piranhas.

I have not heard from Mr. Kreege in some time, but have not heard from him in some time, but have heard from him in some time. My plan, therefore, is to have a mail every two days, from Piranhas to Tapajó, after the arrival of the boat, steam (the Strumun) at Piranhas, while we send down weekly to Tapajó, our mail, and receive whatever may be there.

After reaching Tapajó, which is about some miles above the last place on the river, I will be able to judge better as to our further progress on the river. I made a trial trip with our mail, and found that we made much better headway with the wind, following upstream against the river current than the return trip. The men can make with oars or poles. They have never used sails on the part of the river, but I have no reason why they should not used to advantage, and they are also cut off at the channels. All of the Commission, and 300. Doby, geologists, continue in good health. Their food and demands have been much stronger upon the Company than is usual. The Mexican Office, the Company, a few leagues away from the river on the Paraguay side is better that in the interior to the east, as at Tucuman, four and a half leagues from Atalaia, where there is little done on sugar culture.

I hope to find the country general improved more as we advance from the government.

(See page 141 with Mr. Kreege's report on the Mexican Office.)

For Post Script.
Dear Sir,

Your letter of the 9th inst. in answer to mine of the 6th inst. was received yesterday. I can accept your thanks for your prompt attention in forwarding the Telegram which I asked for from Capt. Chili.

I appreciate highly your kind offer in tendering to the Command the services of Senator Cavalcanti. If he had been promptly accommodated with the valley of the river below they would have been very glad to have had him with our Command; and if now in tendering the same it 's think of it appears advisable, he will not fail to take advantage of your suggestion, and serve for him.

We made a brief trip to day of our cargo upriver from here to Falcoba and back. We bought up fifteen mules making in our first trip and leaving a number behind in Falcoba. We go now up river as our present need. The object being a present need.

Although the water in the cracks is very slimy, salt, prove to be an important help in asterrying against the current. Although the last arrangement for mail service will now be to send mail to the Command each week, (commenced after the Drinio came) to Falcoba. While we need mail each week to Falcoba (in time to reach the steaming of the proceeding week) and means at Falcoba whatever mail there may be for us.

If you can suggest any new Command arrangement please do so.

Post Script to letter to Sir, Plunket.

P. S. Today, 27th, Amurante, Sampaio, Capt. 3rd. light. Made an experiment trip with our larger boat down to Falcoba and back; and found that with a fair breeze, the can sail up the Channel of the rapids of the Ugaran Rodomera, even with a slight wind, as it was this afternoon most of the day. They came up in three hours (about 14 Kilometers). Took the time heading against the current.

I have arranged to start up the river from Atalho tomorrow. 15th Sept.

I send the animal cargo by the steam boat to Pappajia (ten leagues from here by river, about 4 by the road). Then to wait for the Ayousor. We expect the Ayousor to arrive at Pappajia on the morning of the 16th.
Monday Sept. 15th. We Leave Atalha at Noon.

We sent our last mail from Atalha last night. This morning we occupied in loading on 2 Ajorjas and one Canoe. We have about 104 men on board in Can and a little Manuel de Soto to guide us. His name is Caro de Fries, a man well known among the Indians. He is 60 years old. We have a white, old man and a soldier with us in the small Canoe.

At 12, Noon, we start with the small Ajorja, all of the Commission and Capt. Back on board, with Houzigue and Chico, and the crew of Indians. We have three men and the pilot.

The small Ajorja, like the Canoe, start a little later—10 minutes or so.

We move up sail, with a very light breeze and with the help of the oars worked on an oblique course to the right, and then we follow along slowly or being unsailable we were forced to shoot for an hour or more, then a little said help. Then we fell in holding to the Bacia side.

We send 3 Canoes of our bags to a house and

monday Sept. 15th.

We start towards the Bahia side. We have 3

Canoe, as the other. The small Ajorja, with a man, a long line behind us. It seems as if the enemy was following, but not too close. We have a little way above in came a man who pointed to the south, where the sea appears. We continue in the Bahia side where it is still for several miles. Probably we are in the long one for there are great rocks in the river along here.

A third mile above the first prominent formation. It is another one, that is, the third one, not less, and the second more than 100 feet about the height.

There are 5. There were in the river and at its edge, a man, the man or the water. The other in front is not less than 50 feet about the height.

Then the naked are here to me. A great many of these things appear. They are natural. Not artificial.

At 5, P.M. between the two prominent formations, parallel, about 4 leagues—8 miles, or 13 Kilometers. We stop for the night. The other boats not being in sight, and they have the Gourdetes and tents on board.

At 5, 30. The other two boats sail on beautifully. We are now satisfied. That this is far from the place, we can make seven or eight leagues per day. The wind from the west and the time, 3 1/2 from 2 3/4.

CAMP N°3. League 31 1/2.

Serrote de Sobradinho

REPORT. 1

From Jaguara to the League N° 1. There is only one rapid on this place. It is a good natural channel for small boats. There is a good natural channel of 3000 feet, and

Sobradinho
Tuesday Sept 16th

Leave Camp 3 after breakfast at 8 A.M. N.W. from the high road bef. that N.W. 8 3/4ths by S. N. by E. 8 38 mins crossed the High Brush in a fresh breeze with rippled waves. 3 legs in a N.W. Bore.

Worn the big wind and severe change of weather. A strong wind in the north; 1st, wind very fresh and strong; 3rd, fine day. 10.15 A.M. The wind was 20 to 30 and it was running. 11.55 A.M. Saw the first drift ice. 12.37 A.M. We are ready to go and have arrived at the upper rapid.

The Canal is good. Nothing needs to be done.

10.52 A.M. Strike course and proceed 12 M. 1 17. 14. 15. 16 N. 12.05 P.M. The wind being rather weak we began Cordelling. 3.45 P.M. We are in the Camp. The wind was about 10, but not 19 M. The current was 2 1/2 miles an hour.

Tuesday Sept 16th

The wind is light. The Canal runs from the shore or Canal Channel. The western channel runs to the left and an aground is at right and a little less wind in which would be better rights. It is a pleasant and at the end we are on the right and pulled the mouth towards.

At the second break they failed three being broken. 10.15 A.M. We are coming the channel and the wind 7, 7, 6, 6. 5, 5, 5, 5, 5, 4, 4, 4, 3. 2, 1, 8, 9, 10, 11 mile. Those are the eastern channels.

11 A.M. Steer running a N. W. Course towards the long bar which is in a channel close with 300 feet, a 300 feet, which has water behind it. Part of the bar is close with the shore.

The mouth shown in the chart are in this reaches 300 feet, a 300 feet, which has water behind it. The wind was fair. 11.55 P.M. We are east of the long bar. 12.37 P.M. We are ready to go and have arrived at the upper rapid.

The Canal is good. Nothing needs to be done.

Our motor has been in good order, and runs well. We have been able to proceed through the Canal.

On the upper reach the Channel, in one place, is narrowed to about 20 feet. We have sailed through the Canal.

The wind was very strong. We met a midnight current of 3 miles an hour. Nothing is needed for navigation.

After passing the Channel we have some points marked with flags on the Columns set in the rocks, and to return to a higher stage of water.
Tuesday Sept. 16

Itacutira Rapids

We stop to examine a fossil tree - the largest geode

Cell wall ever seen - we measured it - it is

22 metres long = 72 ft. - above 1 metre in thickness.
The roots, which are perfectly clear - 0.80 metre
diameter - can be seen. Mr. Wood at the bottom end near the water (wetness) evidently this has been

made very flat by the 60 metres high. Near this, there are fine pieces of pieces of sandstone rocks of all sizes,

forming one solid mass; but the bottom of the sandstone

is distinct. The base end partly hidden in sand, the

upper end is lying in the same stone rock just as it

has fallen recently. The ages have formed secrets.

1.15 P.M. In a wide pool. Course nearly North. A

handsome overhanging Curve to the East above the

calming - with quite a few

viewed from the water. The scene along here is

almost a counterpart of the Delaware between

Pittsburgh and Florence. Vast forests beside clear

water and about a half mile above here, the

Bachas side is as sandy hill 80 ft. along then just

like one of those ferry hills - 1.3 leagues on the

flat. The story of things is very different.

3.20 P.M. Breeze fresher and the late showers for

2 to above 4 miles an hour - a good gust the wind

with the Papagena. N.W. at night about 5 miles ahead.

Bearing a new degree East of N.E. from here with

500 ft. of the Fernambuco shore.

5.00 P.M. The banks, Port. Side, Makeira, Average 3-55

for 2 miles along in Bachas side -

River Sugar Cane, Grandiosa. - Beach - forest.

Wooding plantations with these anything. The side of October.

Still it is one of the most beautiful parts of this river in November.

1.55 P.M. Sails stop. We have passed around back of the

head and the wind has died nearly away.

We begin cooking. Sails furled for the night. The day.

2.01. Sails up again - 1/2 miles an hour - a good N.W.

2.10 Sails furled - deep water brings almost invisible current.

2.15 2,000 miles above - 300 ft. position.

2.20 Lower end of a little Bay - Campinhos de Cima.
**CAMP N° 4.**

**REPORT NO 2.**

L.307.

There is already a good navigiation without any work for proper steamer from Sobaquinha, where my encampment last night, to Papogia - 4 1/2 Leagues.

In the rapids of Itacutireca, I would have walked at 3 rooks, in order to show the Channel for descending, and to show it in a higher stage when those rapids are lower.

The current is to be overcome with 3 to 5 miles an hour, with ample depth and ample width 2.00 ft, or more if this be the place where it crowded by me, it is about 140 to 150 - but my depth.

It is possible that the Channel could not be much better than the one we examined in Cetavi sheles of the river.

I think that point must be decided. I am here pleased with the results of the days examination.

**W.M.R.**

6.10 P.M. - nearly dark -

**PAPOGIA.**

Our tents are pitched at the House of Mr. Chaves, an Column for the 12 animals has been brought from about a mile below.

I have concluded to go with the column from Here to Sorubak while the encampment are around the boat to the same point.

**WED. SEPT. 17TH.** We break Camp No. 4. this morning.

Mr. Dury, Mr. Sabacia and myself with Antonio, Cook and Manuel, of the guard, who was with us on my other land trip, and one other of the guards in my special part.

The guard will also go taking charge of the other six horses.

My object in this arrangement is to see how master work on the boat in my absence and to make an examination of the Permanent Banks for a leagues above Sorubak and perhaps further.

The Mihors and Anna started at 4:20 with the wind being deep and sample: The current is the Bahia side and goes up 105, about 3.50. We then break and (Sabacia, Dury, and I) went at 9.50 - Start with the guard.

and rode along - a very hot morning. I went ahead for a mile or two - then Mr. Sabacia and I continued on. We rode on blind till about 9.45. We stopped to wait for the path to be in good shape and as 11.30, I left the guard, packed the bag and went back. I went on to leave the path.

The guard's path was 58° Cent grade = 73° Cent grade = 133 Far Northern

Our path from Sorubak to the camp I went on a man back to my home, to see and help them if he cried.

I then went to the Rain about 1/2 mile from the camp and a dry and dry path from here been in a lot of - I am a beautiful granite back. I saw the Chaves on the other side, 2 miles side at 4.50 - They were a league and on the 13 who is going along - A Carried

Pine and big tree and a twenty - I came in a canoe.

This 3/1 mile wide in the mouth of the river.

At 5.30. The back train came with one man, the back horse, and the cook home. Short 3 Leagues.
Wed. Sept. 17th— Papogaia to Sabuca.

3d Visit to Sabuca.

This time, by Compulsion—on account of the delay of the last train of 3 animals, and the great heat of the day, and our late start—which was unadvisable on account of the necessity of cleaning the horses, and re-arranging the luggage in the baggage car. We were up at 5 A.M.

I think our baggage will make 4 or 5 leagues to-day. I defer my report about Papogaia till getting the baggage part of Soroabe— I hope to-morrow evening.

Note.—Sun Rises to-day at 10 o'clock, or, the finest I ever saw—a full rise, with all the atmospheric calm, and all the space outside of the ring being glistening. A red shade from the clouded heaven outside.

The ring was very large—should think 200 diameters of the lens diameter. It gradually decreased—corresponding about 11 o'clock. It was within about 15 degrees of vertical. The day then became very hot. Of course there was some movement in the upper atmosphere to cause this. I can by no means estimate the numbers—just too many to estimate. I can perceive dais and gradual changes in the density of the air, and in its appearance—though it is not yet easy enough to cause suffering.

Meanwhile the sun flows magnificently, and quietly by with a current of 1 and 2 miles an hour—through 5 or 6 miles wide of ranging density. Standing on a small hump of Halford's Mesa all along, in the Baja side. I think there is also a good channel in this side. No Camp—House.

Sunset say 18° North of West, at 5.58 P.M.

Wed. Sept. 17th— Sabuca.

Mem.—As a rule, all the Horses are small there (the dogs are still thinner) they are active and endure much, because they have to. The food they get is much stronger than ours, and they don't get enough of that.

The men are wear leather hats and leather coats of a brownish-red or reddish brown—said to be the same colour, the hats of the modern dress. The trousers are usually have no hoops and are open both. Own home cannone leather, and home made cut. I think a boot worn last ten years.

No wagon, or cart, as a rule. We did meet 2 or 3 carts with oxen, and wheels the roughest of the vehicle kind I ever saw. The wheels may have approached a half as new. There may be some men of these

Thus Sept. 18th— Sabuca to Soroabe 2 d

Visit

We arose the party at 6 ½ A.M.—intending to make a very early start, but with much unwillingness, before we left the house it was 6.20 A.M. had come. Then for an hour we were still far from the time fixing the start. Then at 9.30 before we came fairly under a cloud of dust out. We. From forgot along well enough over the same track that we came out at the 4

q. 9.10.—We pass the Patagon River. The same as a little farm in the bottom of the valley. Two years without water enough in it to make it anything except a dry. The Pajaro river has not been dry quite as long as the Mecosta.

q. 9.30.—We are on the Red mesa peak.

q. 10.15.—in arms at Soroabe.
Thursday, Sept. 18 - Sorobabe, 2nd Visit

It was extremely warm & hot - I had my coat in a tin and carried my white umbrella. I walked about 5 miles on the island, including some details along the headland. I found the Bahia Channel in the middle of the island, running out to sea. I could now see confidently, the water to be between about 1 fathom and 2 fathoms deep. I could see the upper leagues of the island, as it was a most picturesque view for the sternboat navigation.

I saw the island as the head of the island, with a large volume of water near it, quite equal to the sea that flows down the Brandon branch. I examined the water near it, between the island and the Brandon. I could see the island as the head of the island.

I was uncertain until 6:15p.m. when the water near the head of Sorobabe Island. Possible Map shows the island.

The water is shallow, canal and shallow. The Brandon branch flows over from it, between the island and the Brandon. I could see the Brandon branch flows over from it, between the island and the Brandon.

I saw the island as the head of the island, with a large volume of water near it, quite equal to the sea that flows down the Brandon branch. I examined the water near it, between the island and the Brandon. I could see the island as the head of the island.
Camp No 6

REPORT No 5.

304 leagues to 299 Leagues.
A good Steamer Traffic all the way.

We are now near the foot of the rapids, stalls of the Cachoeira do Vão.

Approaching from below.

Friday Sept 19th -

[Narrative text continues in handwritten format, discussing navigational details and encounters along the river, including a map of the area.]
11.25 1/8 mile below the ground fall is a rocky obstruction 6 inches in depth in 200 ft. on the ground fall. The distance is 2000 ft. 

11.33 A passage 1/8 mile below gives a fair obstruction of the island at the foreshore for small vessels. 

11.38 1/8 mile below heavy obstruction for 1/8 mile below falls of 300 ft. The passage is then marked to the island exit, 2000 ft. 

12.45 Scenery and curve island. Upper end of Cabacco. Here the water is clear from the main river on the mid side of curve island. On curve island are some rocks as a little high stage of some of their hills. 

1:05 Any other fall where the river is 3000 fathom deep. Above the Cabacco falls is Rocky Channel 5000 fathom long and 12 miles from 200 to 5000. 

Then some route to be taken over to make good noon. 
Men in a week arriving 5000 fathom deep. 

1:20 Cap de Boa Vista 

1:45 It is half a mile below when the large body of water comes in and below the back of the falls. 

About 3/4 mile 1:400. The way to improve a low dam at the head 350 ft. long and then a high dam 2000 ft. wide 3000 ft. long for a good steamboat. Channel then 400 ft. wide for 300 ft. deep blasted. 20,000 ft. 

Pilot car to reef 1:400 "Write Wm with Long. 

1:40 O.P. Highwater. "Write Wm with Long. 

1:40 O.P. Highwater. "Write Wm with Long.
Sept. 20, Saturday, Sorobabe, 2' visit.

Soon after breakfast, and just after all of the Enquiries except Mr. Babik and I, the mail man came with letters and papers for the Commander. Sent a note to Mr. Kruger, our mail man had not come to sail, etc, but he had not made his appearance again.

Letter from Mr. Kruger.

Cpt. Jones and Mr. Roberts. A letter coming from Cpt. Jones, and a letter from Mr. Roberts.

Capt. C. J. Hakon.

P. S. This man when I leave the mail in Company with your mail man, to be as your Command during his stay in Paranheas.

The engineers who have been engaged on the Bahia side, running levels, and transit etc., having made positive report of Conclusions that I will go over myself again, tomorrow, and verify, and get a better idea of the facts, points and results.
**Sunday, Sept. 21, 1870 - Equinox**

Closed letter and made up made for our cargo and left the package in the hands of Mr. Amaranty, who had translated my letter to Him. Then, with Mr. Castellanos, we ascended the mountain from the base below the falls. The last end of Sorobobo Island.

<table>
<thead>
<tr>
<th>R. S</th>
<th>Second Sight</th>
<th>Height Above</th>
<th>Dist.</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.320</td>
<td>3.710 + 3.676</td>
<td>0.76</td>
<td>250</td>
<td>Surface water below 100 ft. long.</td>
</tr>
<tr>
<td>3.010</td>
<td>2.74</td>
<td>0.27</td>
<td>1.03</td>
<td>350</td>
</tr>
<tr>
<td>3.57</td>
<td>3.26</td>
<td>0.15</td>
<td>1.18</td>
<td>600</td>
</tr>
<tr>
<td>2.37</td>
<td>2.28</td>
<td>0.09</td>
<td>1.27</td>
<td>600</td>
</tr>
<tr>
<td>3.18</td>
<td>1.81</td>
<td>1.97</td>
<td>2.64</td>
<td>800</td>
</tr>
</tbody>
</table>

**Sorobobo Island.**

**Monday, Sept. 22, 1870 - Farewell to Sorobobo**

6.45 A.M. Start. To go up Pernambuco Bay, ride the regular canoes Channel. 9 A.M. Reach the mouth of the river. 12 A.M. Reach the river mouth. 2 P.M. Reach the river mouth. 5 P.M. Reach the river mouth. 7.30 P.M. Reach the river mouth. 10 P.M. Reach the river mouth.
Mon., Sept. 22nd — Along Sobra de Channel.

In the morning, we set out again and walked up to the island, passing two small canals to the river. When we reached the island, we noticed a path along a narrow, little channel about 1/2 a mile. The present bay, Canoe Channel, was being cut by a small river in the island. The channel of the stream was about 100 feet wide.

At 11:00 a.m., there was a small, semi-tidal creek, and a strong, fast current. The island side was an island, with a small town on the island.

The General Course of river was about 100 yards, but curving to the left.

A good channel, 60 feet wide, can be made here, at A.

The river, Coffee Can, is 60 feet wide, but only 500 c. m. wide and 500 c. m. deep. High water at high tide. The current is strong, and when the water is low, it is about 800 feet wide, and made into a dam with stone and timber, averaging not less than 3 feet, which will have no effect on the current (which could not attempt to flow) into the wide channel. There, with the additional water to be thrown into the sea, there will be water enough for a good navigation channel.

The station, "Milner's," arrived at 11:30 a.m.


10:50 a.m.: The barges, with our goods, which preceded us down the river, were unloaded here.

We now had breakfast. In view of the occasion, the barge, paquet, with our goods, which preceded us down the river, had been unloaded here.

10:30 a.m.: We were returning to the island, and it was nice to see the beautiful scenery.

11:00 a.m.: We were now running across the island. The channel between S. Antonio and the small island (in the middle) before S. Miguel, is about 100 feet wide.

After breakfast, the small stream, 500 feet across, is a close waste. Both the stream and the island.

12:00 noon: We were now running along the west channel between S. Antonio and S. Miguel.
San Miguel Island, S. Antonio 10

12.40 No Point of the Island 10 miles from San Antonio and San Miguel. 11am.

12.50 The Channel is $200 to 500 feet wide with a Channel 0.5 miles wide with higher ground.

1.03 Now we have turned C.W. by a large bank of mud and are in the Channel between the Islands of San Antonio and San Miguel. We are in the Channel to the east side of the Island.

0.07 In an 80° Channel with little pitches.

1.15 A hard pitch. 3 barnacles. We take the Channel and with a cord and double two we just dig up a hard ball of barnacles in the Channel.

1.33 All the barnacles are at the head of S. Antonio Channel. When we leave the Channel, the Water is 1000 feet wide and there is a Channel to the north side of the Channel.

1.40 We come from Rodello. Here are several rocks in the Channel.

2.45 Shove up on a pitch. With cord.

1.58 Opp. upper end of S. Miguel Channel comes to the Island of San Miguel. The Channel is 1300 feet wide and 1500 feet deep. The Water is 500 feet wide and 1500 feet deep.

2.00 We are in the Channel to the north side of the Channel.

2.10 We are in the Channel to the north side of the Channel.

2.22 Opp. lower end of Cabacos Island. Here half mile wide (200) feet wide with high grass.

3.05 Between the Island of Cabacos and the Island of San Miguel. The Channel is 200 feet wide and 1000 feet deep.

3.20 We are off the Channel and out on the Channel.

4.42 We have been working our way through one of the harder pitches we have had. The Channel is now off to our right. The pilot says it is steep, and it has that appearance. Half mile wide and 1500 feet deep.

4.10 We come in to the Channel. Some of the Channel is very narrow. The Channel is now off to our right. The pilot says it is steep, and it has that appearance. Half mile wide and 1500 feet deep.
In the main ruin now. Rodelles. Rodelles.

4:13. The water comes down on the left side of island da Isla and turns and runs up station and is actually ascends directly up stream through a small chute in the canoe channel.

4:23. We pass up a small rocky chute without trouble.

4:32. Now listing am in the rocks about to arrive at Rodelles town just ahead.

5:05. Arrived at upper end of the village of

The Missão João Bosco do Rodelles.

League. 297.

The name looks and sounds much more imposing than the village betwixt; although it has two churches; but no padre.

It is nothing more than a village of Canoes now and their families. No stores or business house here. Our landing place and encampment is really opposite the head of Ilha da Porta.

We are now almost directly opposite the head of the island of Cuiabá where I was on Friday Sept. 19th in Sec. M. Dr. Saboia and Mr. Bayly.

Here we have a man nearly as tall and white, clothes worn down, some of them given with a sort of yellow gaiter, are rather dirty, and many of them much worn with use.

Our tents are pitched under a pecan tree, looking tree, called the Caximbera. This composes of many trees, comprises the whole making a mass about 7 feet in diameter. The tree has handsome foliage through the leaves are quite small.

Report No. 4

Respecting the channel for a Steamboat of light draught, between Rodelles on this part of the river and the town end of the settlement of 80 to 90 babe from whence we came to day, we satisfied that it can be made in two ways; one way down the Pernambuco branch, which...
Sunday - Sept. 23.

Rodelles.

After making inquiries of the pilots and Carroniers who live here, concerning the Channels, I have decided to remain here to day and to remain two.

Next week, I presume will examine the one farther out from the Bahia side, and also the soundings from the point of the village Célette out to the main Channel, while I with my men examine the one nearest to the Bahia side.

Two passes on the other side and the inner one on this side of the great rock Wiroula which forms in front of the village of Rodelles.

Pilot reports give above the Chart made of them.

Soundings - in Metres.

6.38 above M. about 2.3 M.

9.00 - 2 Rocks to right of good wide Channel 11/2 M. close.

9.45 - 1 Rock on each side of 50/8 below 1 1/2 M. deep both sides curve to right now 2 Meters.

9.48 - Channel of rocks above with a few small rocks with 1 1/2 M. depth on them a few Doctors 6/2 Meters.

9.50 - Tangent - then curve gently to left 1 1/2 to 2 1/2 M.

Channel clean 60/4 of M.

9.52 - Rock 11/4 M. close.

9.53 - Rock both sides 5/8 2 Meters 1 1/2 M.

Now one curve to left 1 1/4 to 1 1/2 M.

9.54 - 1 Rock good 3/2 M.

9.55 - Channel opposite side 1 1/4 - 1 1/2 - 1/4.

Then curve to left 1 1/2.

Running one broad glass. Porta 1 1/2.

G. 5.6 - now keep curve to right 1 1/2 - 2 M.

G. 5.7 - Now steering toward Bahia Channel. We are.

9.57 - Atop a hill. Looking through. Wind right 1 1/2.

10.05 - Another gentle slope 60/4 M. close 1 1/2 - 1/2 M.

10.06 - 2 B. 1 1/2 with 3 1/2 M. now 2 1/2 M.


10.08 - 2 Rocks to the middle 100/8 lat. 2 1/2 M.

10.07 - Good wide, clean 2 1/4 M.

10.10 - Name 1 M. with 5 M. own Call.

10.11 - Name 1 1/2 M.

10.13 - Here we are.

10.14 - Name 3/8. 1 M. Porta to own Call.

10.15 - 1 M. 1 1/4. 2 1/2 with 2 1/2 M.

10.16 - 100/8. Good wide clear 1 1/4 M.

10.17 - Good wide 3/8 M.

10.18 - Then own Call.

10.20 - 1 M. 1 1/4. 2 1/2 with 2 1/2 M.

10.21 - Good wide, clean 1 1/4 M.

10.23 - Good wide 2 1/2 - 3.

10.25 - 1 1/2 2 1/2 - 3.

10.26 - a. 3 1/2 4 M. 3-3 1/2 150/8. unnamed.

10.27 - 2 1/2 with 3 1/2 M.

10.28 - 3 1/2 named 4 1/2.

10.29 - Good wide 1 1/2 - 3.

10.30 - Good wide, clean 4 1/2 - 3.

10.31 - Good wide 2 1/2.

10.31 - 2 1/2 M. close.

10.32 - Good wide 2 1/2 M. own Call.

10.33 - 2 1/2 M. own Call.
Tuesday - Sept. 23.

Standing Halley's Channel.

10.33 - 80° - 2½ - 2½
dem. Chute 3 - 4
34/4 Chute 80° deep. 3 ½ f.m. Good

Good Point in Chute only - M. ilii

10.36 - Belayed by Beatty. Further Channel above. 4½ Miles

10.37 - Below Chute 8 miles deep. Then 5 miles.

10.38 - In M. ilii, deep Channel - 6 to 7 M. 6

10.40 - Wide, clear, 1½ miles, 1½

Island for the night - 1½ M. 5

10.45 - A few of M. ilii and 1½ f. m. sooner


Good Navigation:

Approaching small Chute along Javacarabi 8 2-1/3 1½ - 2½

10.49 - Chute 2½ - 2½ (Good wide?) 2½ - 2½

10.50 - Below Chute 3 M. 6 - 5½ 4½ (pog.?) 3½

Approaching another Chute. 3½

10.52 - Chute 3 - 3½ in Chute 6 wide 5½

10.51 - Chute 3½ - 3½ & in post below.

10.53 - Never any in the main Channel 3½

Stop: Fine navigation on the

11° 11 - Start back - men breakfasted

1° 35 - Arrive at Camp No. 7. [We met the "Anna" going down the other Channel.

Report of Mr. Wheeler (arrived by Dr. Lisboa) of the Channeled winding of the other Channel - East of the peak Vucubí - and of the boundaries of the Upper point of the Chute Island - at the inlet of the Pernambuco branch of the river.

Sir, Wheeler & Lisboa have just come back in the "Anna" 4 P.M. having discovered a Channel from the same point (or near vicinity) that we started from this morning to the main deep channel at the Javacarabi - above where we dropped our soundings. They find a Channel everywhere more than 2 meters deep at this stage of the river, and most of the way are 2½ metres. There are only two places less than 2 metres and no where less than 1½ metres; and the cost of bringing the two places over 1½ to 2½ meters deep will be quite trifling; not over a few hundred meters. We are therefore sure of a Channel without any work whatever 1½ meters deep from the deep pool above Rodelles to the Pernambuco Channel at the Island Javacarabi ½ meters or may say 2 meters deep with an insignificant deflection, but it comes entirely a new navigation to make the Channel straight and safer. Accordingly I no longer consider the Pernambuco Channel along the Island Chute necessary to make a fair steamboat navigation.

The actual course will be between the lower end of the Island Javacarabi and the last chute (above the lower end of Soroabaké) on the left of the Pernambuco Channel or Say 3¾ miles = 6 Kilometers.
After examining the Hatfield Map Channel, from a point about a mile above the Savannah of the wide, clear, deep Channel along the head of the island of St. Ann's Bay - where it strikes the Channel along the Pernambuco side, I am enabled to say that at this present stage of the river (said to be within a salting or within 8½ inches of extreme lowest stage) very little labor comparatively, is needed to make a steamboat navigation, say for a steamboat of 100 ft. long, 20 ft. wide, draught 3 ft. I ended with the pilot (Levi) whom we had to pay, and such a steamer up and down, but, in order to reach the deep, some obstructions should be removed or marked.

But if I were required to assume a depth of 1½ meters, or say 5 ft. of draught, at extreme low water, the cost would be considerable, because it would be necessary that an area a metre below the surface would have to be summer, probably, in most cases, by 174½.

Page 174½. This has Book. Expense will be chiefly the construction of low-water dams, to prevent the waste of water from the Pernambuco Channel on toward the Bahia side.
The chief objection is between the islands Carambó (foremost) and the upper point of the island San Miguel; between San Antonio and Island da Richeira, or across to the small intervening islands, in order to prevent the waste of water from the Pernambuco gulf to the Bahia side and the draining of the Pernambuco Channel at the Cachoeira, and little Rapids, as noted in my journal of examinations of that Channel. See Journal of Sept. 22, and of Sept. 18.

I am greatly pleased with the result.

I consider that I have now returned from Jamaica to Rodelles 17½ leagues - 57 miles! These rough approximate but. Cost of a 1½ meters navigation at low water.

Evening Sept. 23rd. 1879.
.
We are to start with the N. W. M. R. & "Milan" and "Anna" & "Milna" at 6 a.m. tomorrow.

See Vol. 2d.
Sister of Wm. - Sent Sept. 7, 1879
To Addie; to be sent by her to the Pitt, Pa.
Wm. Cot. Yates. J.
S. W. Roberts
R. M. Landale
R. M. Roberts
S. C. Heus
W. C. Montague
Geo. E. Beebe
Capt. Williams
Wm. A. Billings
Mr. J. A. Beeler
Geo. G. McClure
John引发了
H. M. Robt.
Capt. J. H. Day
Miss. E. Elliott came back
Capt. James Merritt
J. A. Robinson, New York
Mr. J. Richard, Elizabeth
Mr. Joseph Robb
Mr. Charles McClure, U. S. A. Post
Mr. M. McClure, Carlisle, Pa.
Jubba according to Mr. Zuger
Calling was called at Peranhan
Diff. level = 821.11 ft =
281.52
31.18*
250.34 M.
M. Halford gave Jubba 688 ft
Diff. 630 ft
821.11
630
191 ft Difference
The main source of the Rio de Sao Francisco is in the eastern parts of the Sierra da Canastra, the quiet central platform of Minas Gerais, between S. Lat. 20° 20' and W. Long. 3 (Rio de Janeiro).

St. Hilaire gives the Casca do Anta Cascade 667 feet of altitude, Water West 1 East 3 3/4 leagues as near mountain torrents. Before reaching the Paraopeba it is about 140°, max. depth 3.25 feet, discharge 130 cubic inches per second = 1 300 ft. per min.

Position is then from S. W. N. Serra Grande or Capan, pace on the E. and Mata de Corde forming the W. wall.

Paraopeba to Pirapora Rapids 50 leagues, it makes first W. then E. dist. 40 2/3 geo leagues (226)

145 metres 140 miles

Pirapora to the Cachoeira do Sobradinho 239 to 240 leagues ready for a steamer, and includes the Rio das Velhas a total of 508 leagues can be made transportable with little difficulty.

Below the Sobradinho 29 clear leagues, followed by 47 rapids which though dangerous, are transportable to raft and canoes.

From Vargem Redonda 25 to 26 leagues are unnavigable including the Great Rapids of Paulino Affonso. Finally below the line of Rapids 42 leagues, upon which steamers now ply.

The Annuaire du Bureau des Longitudes de France assigns to the Sao Francisco the 4th rank amongst the streams of S. America.

Amazon 5400 Kilometers = 3348 miles

Parana - Plate 3440" 2133"

Socapere 2300 " 1426"


But M. Liais has shown - Soane to Mouth of Rio das Velhas 8600 Kilometers, hence to Min due 2100, making 2900 Kilometers = 1798 English Miles.

Cosmic rank 17 or 18.
A line could be curved in that would run to near the brow above the middle of the harbor without encountering any rock cutting worth mentioning from its west. It could be run so as much easier from down stream and have no rock.

The second stage 200 feet back from the near bank is 900' to the surface. The low intervale between these ridges there is no rock.

The main ridge just back of the proposed harbor is hard and change slope of at least 100 to 250 feet depth from the surface. On the upper end the ridge is the surface about 300 feet of good rock about.

The Sound A points the harbor from the current will be in low tide from the water.

At 30 days the sound B will be a little hard for no water in low water good and pretty well protected in medium stage, but in high stage, it will lose its character as a little harbor the current makes across from the ground about 1 mile. One must approach against this rock bluff very strongly. The water command show it.

For high water an artificial breakwater at the point B or on the north point of the shore and turn the point out with rock in the middle mixed with brush and make a good fronting breakwater or bar 50 feet. On a southeast. On the west 2 to 1 in rocks above water 10 meters deep in low water or a point filled with stone break. It will cut about.
Manuel de Nascimento Alves Lencastre  Sec. da Est. de Fretamento da Paulista Affonso Machado — Av. António R. Rua de Jockey-Club 36  S. Francisco Xavier  

Reynaldo Von Kneigel  Eng. em Chus  Estrada de ferro da Paulista Oficial  

Em Cabrobó  Fortunato Francês dos Santos (Vigário Antônio José Ferreira) de Novais  

António Telle  de Alencar Luis Barreto  

Pereira da Andrade  man who int  

to Cabrobó est. Canos  

Gomes da Costa  of the Terceira 7  

N.12  Guaíra  

Halford's measurements of the Río São Francisco — at Barra Grande in 168 leagues on 176,712 c., palmam per second = 1779.8 meters  

= 62,941 cubic feet per second  

= 3,776,460 cubic feet per minute  

On Leagues  

Halford  

Das Velhas 9,159 c. Palm. 97,08  

S. France 22,893 238,43  

Total 31,652 335,51  

Calling a palm 0.22 meter, and a C. palm 0.0106 c. meter  

W. W. Heightes  Measurements of the flow of the Río São Francisco below the junction of Das Velhas: 

qwm 31,652 cubic palmas per second = 1478 c. palms  

qwm 335.51 c. meters = 11870.34 c. feet per second  

20,196,60 c. m. = 712,221 c. ft. per min. This is 1300 miles above the mouth, or 50 miles above the city, the average low water flow of the Ohio at Pittsburgh 967 miles from its mouth. 

Total area of new ground to be made at Santos 35,020  

Deduct area of the new Sheds to be removed 20,427  

Leaves for building = 14,593  

319 Hectares on 1/6th Seção.  

347 Piranhas  

2.88 Pizzarana 297  

3.92 Defferraz 314  

23.04 (N) 594 179.99 178.17  

576 864  

44.64 CubanVolume  

Measurement of Río S. Francisco above the Falls:  

River about 2½ palms — 21 inches above surface low water.  

Cubit. m. 1267  

At Atalho c. m. 1267  

Plan 758.7 Hubbard 1257  

Keel 4.25 meters deep 2.25 m.  

2 channels 3.50 ft. deep per sec. 707.5  

Loro 1 Crane 0.72 m. pl.  

480 1 Sello  

1 Cubic palm = (Cubit. m. 4.25 x 700 = 1470 c. m.  

5114.125 C. m. = 4972.5 c. ft. per sec.  

1 cubic meter = 2.633,500 c. ft. per minute. As the  

New York stage of the river. Deducting 5 for  

Where low water leaves 2.146,800 c. ft. per  

The low-water flow at Atalho.