

THE AMAZON RIVER FLOOD.

By DR. HAGMANN.

[Extract translated from *Revista Mensal de Meteorologia*, Rio de Janeiro, Brazil, May, 1922.]

The flood of this year [1921] in the Amazon River was extraordinarily great. The water reached a height beyond that of previous years.

The Amazon River, as a rule, rises until the end of the first fortnight of the month of June. "Saint Antonio is at the head of the water," says the Indian. * * * The flood of the year, 1921, was 20 cm. greater than that of 1918, which old inhabitants thought to have equaled that of 1859.

Laborious, but very interesting, was the work of computing the superficial total of the overflowed areas in the valley of the Amazon in order to have some idea at least of the enormous quantity of water that would be necessary to produce a flood of such proportions.

I am personally convinced that the enormous floods that have recurred in these last years are not so entirely the result of the extraordinary precipitation in the high regions of the Amazon River, as a study of the reports received from the commandants of certain affluents of the Amazon do not show a greater quantity of water. I am of the opinion that the reason of the great floods may lie in part in the constrictions in the mouth of the Amazon. On the front sides of the islands of Bailique, Cavianna, Mexiana, and Marajo is the celebrated bank of sand, "Santa Rosa," many kilometers in width and length, where the water is barely 6 meters in depth. These channels are narrow, tortuous, and liable to constant shifting, and do not permit the entrance of trans-Atlantic ships.

I lived for two and one-half years on the island of Mexiana, and for this reason I know the mouth of the Amazon very well. The mouth extends from Mexiana to Belem, three days' sail by boat, to say nothing of the danger from the wretched climate.

Islands form and disappear as the waves scour and carry the sand loosened from the banks. Points of islands with great trees from the virgin forests fall with the constant erosion of the water, always agitating and dislodging from the outer banks masses of sand that constantly increase, the first foothold for the growth of grass and rushes, and later for the bushes and trees whose seeds were floating around. The dark gray color of the water shows conclusively the quantity of sediment that it carries.

On this account the opinion can not be rejected that in general the mouths of the Amazon have become constricted, leaving not more than sufficient opening for the waters in winter time, thus causing in part the enormous floods of the lower Amazon.

A plotting of the pluviometric data for the stations along the Amazon would contribute much to the solution of this problem, so interesting in connection with the hydrographic knowledge of the "river sea."

Discussion by the director.—The director expects to visit various places in the States of Para and Amazon, the flood and rainfall stations, as soon as he has finished a hasty study of the proposition of Doctor Hagmann. The installation of these posts will be completed by Inspector Avellar Figueiredo, as soon as he has completed his mission in some of the Northern States.

An interesting feature of Doctor Hagmann's presentation is his belief in the possibility that the sedimentation in the mouth of the Amazon River causes some of its floods.

It would be advisable to verify this assumption which, a priori, appears to be hardly acceptable, because the tide and the strong-running equatorial on the coast would be sufficiently strong to impede the excessive formation of banks, or bars, at the mouth to such an extent as to retard the passage of flood waters.

A hydrometrical chart would probably better reveal the solution of this interesting problem.—*H. C. F.*

FROST-FIGHTING IN THE PECOS VALLEY.

CLEVE HALLENBECK, Meteorologist.

[Weather Bureau Office, Roswell, N. Mex., December 7, 1922.]

Fruit-growing in the Pecos Valley of New Mexico is an attractive proposition or an extra-hazardous one, depending upon the point of view. The quality of the fruit is unexcelled, the abundant sunshine imparts a coloring not attained by the same varieties in other districts, and the leading varieties ripen at a time when the large markets are empty of apples. The Jonathan apples of the Pecos Valley are well known in England. A noted author declared that the discriminating taste of man now demands "caviar from Russia, olives from Italy, apples from New Mexico," etc.

On the other hand, there probably is no other fruit-growing district in the United States that is as liable to spring freezes as is the Pecos Valley. On an average, two freezes occur each spring after the apples are susceptible to injury therefrom, and in only 3 years in the last 18 have unprotected orchards borne full crops. On a 10-year average, the unprotected orchard is only 45 per cent efficient, and this 45 per cent practically equals the current upkeep, taxes, and interest on the investment, leaving no profit to the owner.

During the past seven years there has been a decided resumption of orchard heating in this district. This is in small part due to the fact that for eight years no spring freeze has arrived unheralded, and that such can occur in the future is well-nigh impossible. But the principal

cause of this revival is due to the fact that in the past 10 years unprotected orchards have borne but one full crop, with six total failures, while protected orchards have borne eight full crops in that time. It is now the unanimous opinion of the leading fruit growers that apples can be saved every year, for all the veteran orchardists brought their crops safely through the record-breaking freeze of April 19, 1922; and in 1920 two of them, who did not know when they were whipped, saved full crops against minimum temperatures of 15° and 16°.

The object lesson was clear. Consequently, in 1922 hardly an orchard of commercial size could be found that was not equipped for frost fighting. Every serviceable heater in the valley was impressed into service, several carloads of additional heaters were shipped in, and a few procrastinating orchardists, unable to secure heaters in time, distributed baled weeds and straw through their orchards, to be burned as occasion required.

Frost fighting.—Six or seven acres of orchard is about all that one man can properly look after. In small orchards of 30 acres or less the owner and his family, with a hired man or two, are usually sufficient to handle the situation, but in the larger orchard a "frost-fighting squad" is required, and necessarily it must be recruited principally from the town population. The members of any one squad, therefore, are likely to be well scattered