TEST OF THE NEW FLOATING DRYDOCK AT ALGIERS, LA.

BY FREDERICK MOORE.

We present an illustration showing the recent test of the new floating dock at Algiers, La., by docking the new battleship "Illinois." This vessel is a sister ship to the "Alabama" and "Wisconsin." She is of 11,565 tons displacement, 17.4 knots speed, and carries four 13-inch, fourteen 6-inch, and twenty-eight smaller guns. She was built at the Newport News shipbuilding yard.

When the late war was imminent, the Spanish government placed an emergency contract with Swann & Hunter, Wallsend on Tyne, for two floating docks of 10,000 tons capacity, and offered premiums to the builders and the towing contractors for the completion and delivery of these docks respectively to Manila and Havana, in the way of several thousand pounds sterling for each month that the contractors clipped from the contract time of delivery. In just eleven months from the date of the contract the now famous Havana dock was delivered at that place. It cost the Spanish government $595,000, $150,000 more being paid for towage and premiums. It arrived in Havana about two months before the blowing up of the "Maine," and served the few Spanish cruisers then about Cuba in getting into condition for the war. Unfortunately for Spain, the dock was misplaced. Had it been sent to Santiago, Cervera's fleet would have been able, at least, to have made a better run, for their bottoms would all have been cleaned and scrapped.

The other dock was not finished until after war had begun, and after the declaration of peace it was taken to Port Mahon, Balearic Islands.

By the treaty of peace it was agreed that all movable property belonging to the Spanish government might be taken away. The board appointed to pass upon movable and immovable property declared the Havana dock movable; but Spain had no use for it, in her comparatively shipless state, and sold it to this government for the paltry sum of $185,000. Although we had no occasion to dock our battleships during the campaign, considerable uneasiness was experienced over the fact that in all the southern waters there was no dock large enough to take an American battleship. A small floating dock had been towed to Pensacola; and Key West, Mobile and New Orleans had docks that would lift torpedo boats and small cruisers; but there was no dock south of Newport News able to accommodate one of the government's larger ships.

Immediately after the war, a contract was awarded for the building of a floating dock for Algiers (just opposite New Orleans) that would lift any vessel in the navy. This was to be the largest dock of its kind afloat, 15,000 tons capacity with decks two feet above water, 18,000 tons awash. In October the dock was successfully towed from Sparrow's Point, Maryland, its place of construction, to New Orleans. This style of dock was decided upon for three reasons: First, because a graving dock could not be built in a stable way in the alluvial soil of the Mississippi's banks; secondly, because of the variation of 18 feet in the river levels at high and low water; and thirdly, because of the cheapness of first cost (one-third less) and of maintenance, as compared with stone docks.

The test of the full capacity of the dock could not be made, for the reason that the "Illinois" displaces only 11,565 tons; but the test of that lift was entirely successful and satisfactory.

The Havana dock is being put in thorough repair, and will very likely be towed to Manila to augment the naval station there.

Under the terms of the contract a two days' sea trial was lately made by the "Illinois," when the ship was thoroughly inspected by the naval board and was found to be in every respect satisfactory.

The "Illinois" will be the flagship of the European squadron that will represent the navy at King Edward's coronation.

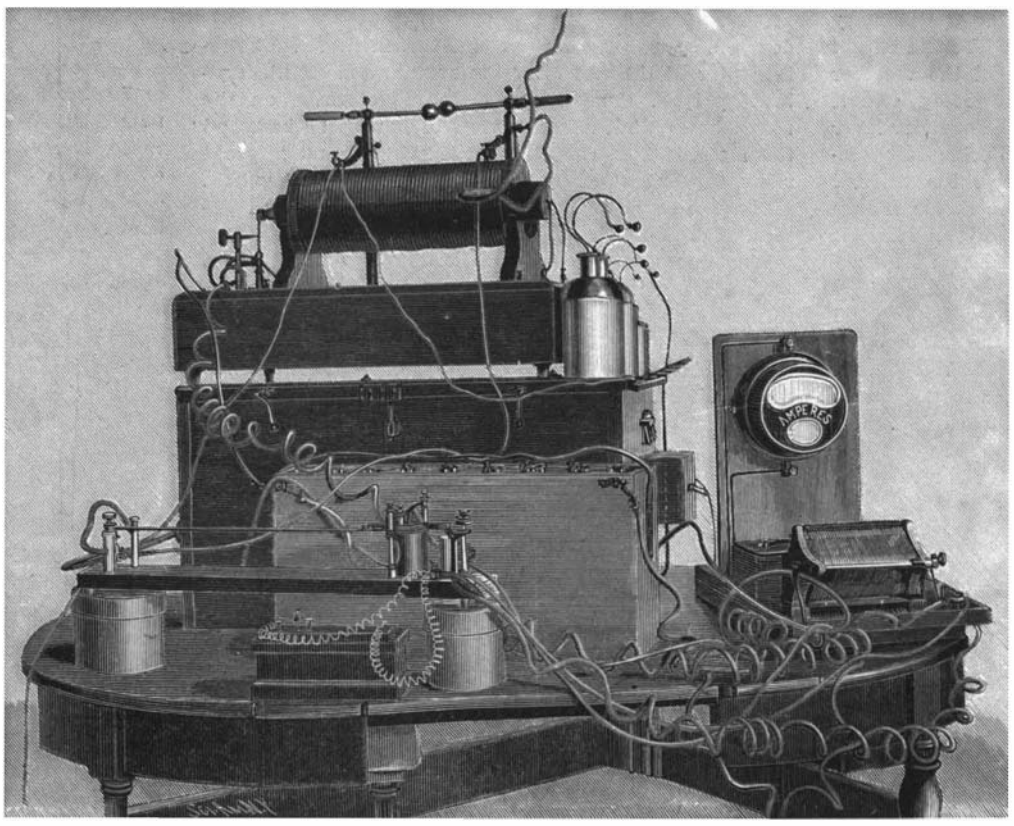
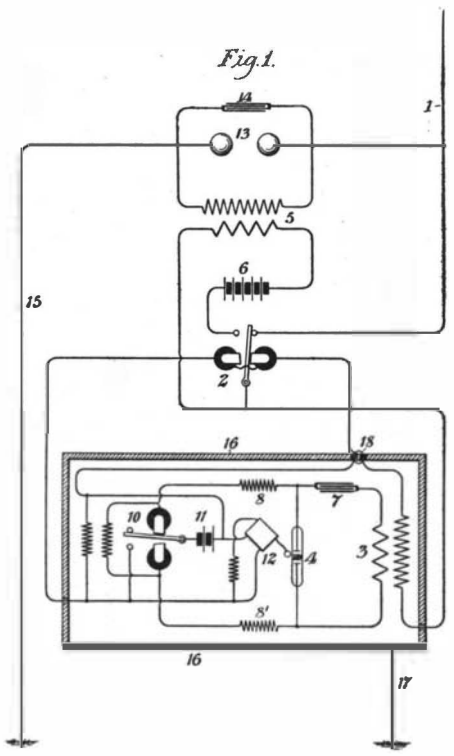
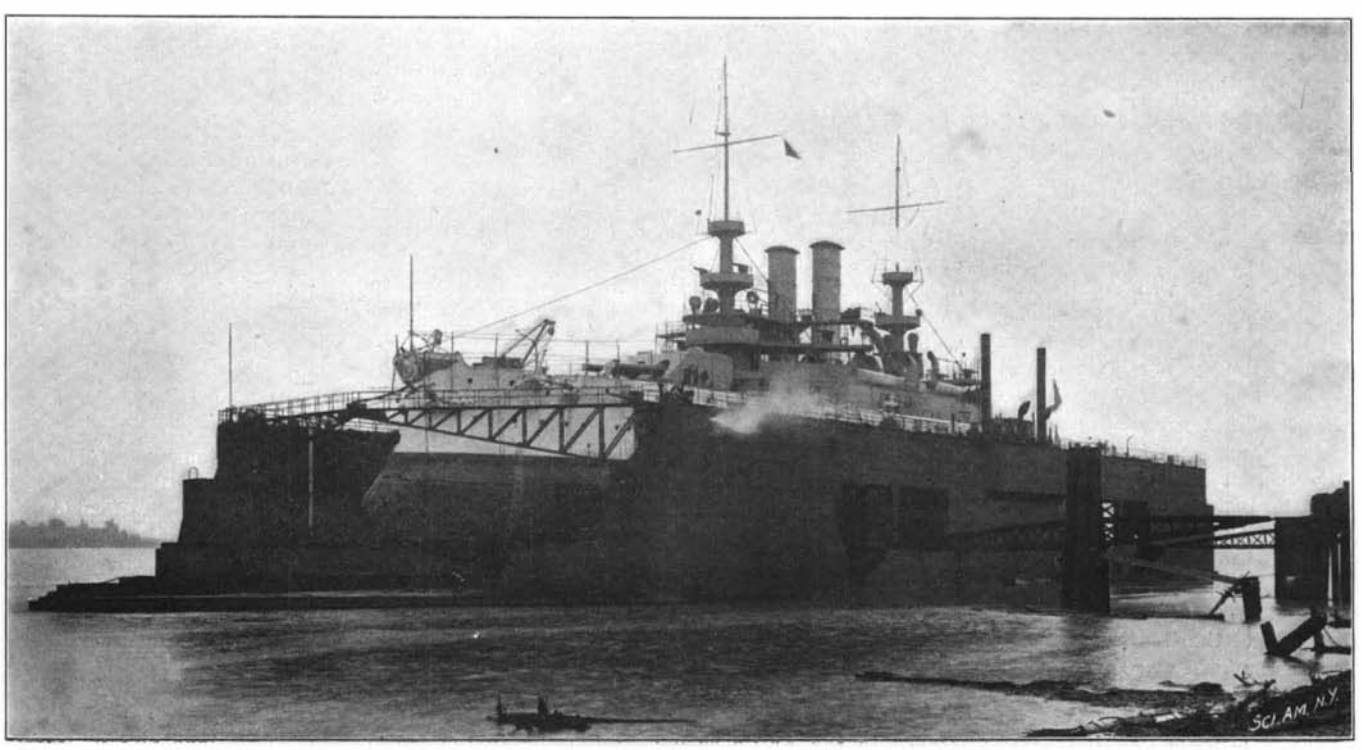


Fig. 2.—THE GUARINI WIRELESS TELEGRAPH REPEATER.



DIAGRAMMATIC VIEW OF THE GUARINI WIRELESS TELEGRAPH REPEATER.



BATTLESHIP "ILLINOIS," TESTING THE NEW FLOATING DOCK AT ALGIERS, LA.

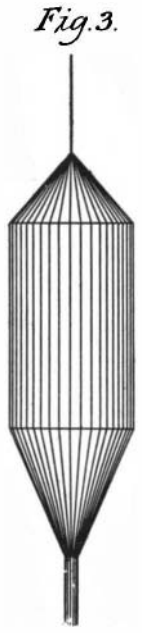
THE GUARINI REPEATING WIRELESS TELEGRAPH SYSTEM.

BY A. FREDERICK COLLINS.

Nearly all the work done in wireless telegraphy since its practical introduction in 1896 has been along lines having for their ultimate purpose one of two objects—the first, to cover distance, and the second, to produce a tuned or syntonized system. Occasionally, however, one's attention is drawn to some investigation original to the art, or an invention involving new thought. Among these may be cited the steering of dirigible torpedoes, controlling clocks, block-signal systems and repeaters for wireless telegraphy.

This latter device is the invention of M. Emile Guarini, of Brussels, Belgium, who has directed his energies toward the problem of overland transmission, and to carry his ideas into practice he installed standard equipments at Brussels and Antwerp and his repeating device at Malines.

It is well known that the propagation of long electrical waves over wires may be effected to great distances, but over submerged cables—owing to the excess of capacity and the decrease of inductance—the distance of effective rapid transmission is exceedingly limited. Oppositely disposed to these conditions is the action of electric waves used in wireless telegraphy, for an apparatus capable of sending waves 100 miles by sea, will not propagate waves one-fourth that distance on land.



GUARINI ANTENNA.

This was the state of affairs confronting Guarini when he resolved to operate between Brussels and Antwerp—the two cities being, practically, 25 miles apart; and what made the problem still more difficult, was the intervening ground, which attained a considerable elevation. On one of the highest eminences Malines is situated midway between the two cities, and it was here the messages were to be repeated automatically.

With this plan well in mind the inventor constructed a transmitter and a receiver, and by cleverly combining them obtained a repeater capable of retransmitting a message by utilizing fresh electromotive force and sending out re-energized electric waves. In the wire system there is nothing more simple than the repeater, or relay, as the apparatus proper is called, which, by means of a delicately poised armature throws a local battery in or out of circuit; but current electricity and electric waves must not be confounded one for the other, for current electricity is transmitted by the bound ether or conductors, whereas electric waves are propagated by the polarizations of free ether, i. e., like light waves. Therefore when a repeater is contemplated for wireless telegraphy the apparatus becomes a complicated affair, though to a casual observer it would seem comparatively simple to construct such an apparatus. Therein lies the credit due Guarini. Let us imagine a wireless transmitter, and by this we mean, a Ruhmkorff coil, Morse key and suitable battery; let us also imagine a receiver or combination of coherer, relay, sounder and batteries, and both transmitter and receiver connected to proper antennæ and ground. Now combine the two in-

struments, so that the sounder will close the primary circuit of the induction coil. What will be the effect? The first waves reaching the antenna of the receiver from a distant point will close the relay circuit through the coherer; this draws down the sounder lever and closes the circuit of the coil, rendering it operative, and the instant the spark passes, the emitted waves that should be outgoing and the feeble incoming ones conflict, the former annihilating the latter, the coherer is "choked" and chaos must inevitably result.

Guarini knew all this full well. How he bridged over the serious difficulties, as well as the minor ones, will follow; suffice it for me to say that it required time, perseverance and money, the latter to the extent of nearly $10,000, before the repeater reached its finally perfected state.

The combined transmitter and receiver for relaying messages automatically at Malines is shown in the diagram, Fig. 1; the antenna, 1, is connected with the coherer, 6, through the aerial switch or relay, 2—which serves as the transmitting key—and through the primary of the small induction coil, 3, whence it leads to the metal box, 16, and is fastened to it securely at 18; the metal box employed to shield the coherer and delicate receiving apparatus from the powerful radiations of the Ruhmkorff coil, 5, now conducts the received waves to 17, where they pass into the earth. It will be seen that the lever of the switch, 2, is thrown toward the antenna, 1, and this permits the waves to pass freely to the coherer and thence to the earth; but when this occurs the coherer operates the internal circuits and causes the lever of the switch, 2, to be thrown to the left, so that no more waves may pass to the receiver. Now when the lever of 2 is drawn to the left it closes the circuit of the primary of the Ruhmkorff coil, 5, and the battery, 6. Then the spark passes at the gap, 13, one of the spark balls of the gap, 13, leading to the antenna, 1, and the other to the ground, 15. This disposes of the external or wave systems, as the antennæ and grounds are termed, and it is only needed to describe the internal or current systems operating the coherer tapper, 12, and the relay, 10.

The coherer, 4, is not in series with the antenna, 1, or the ground, 17, direct, but is operated by means of an induction coil like that employed in telephony. The coherer is in circuit with the secondary of the coil, 3; in this circuit is the condenser, 7; in shunt with the coherer circuit is a second circuit acting through the choking coils, 8 and 8^1, and the battery, 9, which, when the coherer drops in resistance, operates the relay, 10. Now, when the relay, 10, is closed, it causes the tapper, by means of the battery, 11, to decohere the filings. There are variable resistances employed to obtain a better electrostatic balance in the circuits, for cutting down local inductive effects and for supplying additional resistance to the coherer.

The secondary terminal of the transmitter coil, 5, leads to the spark gap, 13, and to the condenser, 14. The condenser is for the purpose of "tuning" the system. By this it is not intended to convey the impression that the different stations are in tune with each other, but that portions of the apparatus must be in tune with other portions. Thus if the coil give normally a 12-meter wave length, then the inductance and capacity of the antenna should be made to conform with it as closely as possible.

The function of the repeater is this: When the enfeebled waves from the Antwerp or the Brussels station reach the antenna they set up oscillations in the wire extending through the relay, 2, to the coherer, 4, by means of the coil, 3; this closes the internal circuit, and drawing down the armature of the relay, 10, brings in contact the second internal circuit shown by the heavy lines and leading to the external relay, 2, or, as Guarini terms it, an aerial switch, since it takes the place of the Morse key and controls the emission of the waves from the Ruhmkorff coil as well as the reception of the waves by the coherer. It is evident that when the armature of the relay switch, 2, is drawn to the right, or in contact with the antenna as shown in the diagram, the coherer will receive the waves, while oppositely, the primary of the Ruhmkorff is broken and therefore no waves can be emitted. When the armature of the switch, 2, is drawn to the left, no waves may be received, but waves will be emitted. It is well known that in a wireless telegraph receiving device, there is an appreciable amount of time consumed from the instant the coherer is impressed by the wave, and the instant the lever of the sounder is drawn down; added to this is the inertia of the aerial switch lever, 2, and the magnetic lag of the coil, 5, so that the waves may be easily received before the re-energized wave is emitted.

Fig. 2 is from a photograph of the Guarini standard repeater at Malines. The Ruhmkorff coil shown gives a 10-inch spark, the E. M. F. supplying it being derived from eight storage batteries giving a current of from 6 to 9 amperes. When in operation the spark gap is cut down to 6/10 of an inch. The condenser, 14, shown in Fig. 1, is formed of a battery of five Leyden jars seen to the right of the coil in Fig. 2. The interrupter of the coil is of the ordinary mechanical vibrating type. The aerial switch is elevated on the round boxes, that a better view of it may be had, and the metallic box, containing the coherer and internal relay, tapper and coils sets just below the aerial switch. Under the ammeter is a slide wire resistance for regulating the flow of current to the large coil.

The object of the small induction coil, 3 (Fig. 1), which, according to Guarini's terminology, is a transformer, is to prevent the atmospheric electricity which gathers on the aerial wire or antenna from influencing the coherer, as the difference of potential between the earth and aerial wire is always considerable and gives much trouble in actual practice. This is one reason for using a Morse printing register in wireless telegraphy in preference to the ordinary sounder. On a tape it is much easier to decipher the impressions made by the wireless waves and to differentiate them from those produced by the difference of potential between the earth and the upper strata of air. By those who are versed in the technique of wireless methods it is comparatively easy to know which are wireless waves and those due to local disturbances.

The coherer Guarini employs is of the Blondel type, having large nickel filings with traces of silver inclosed in 1 mm. space, the glass tube then being exhausted. The circuits are so arranged that when the tapper decoheres the filings an additional resistance of 2,000 ohms is added, which with the resistance of the coherer, measuring 1,100 ohms, makes this a total of 3,100 ohms. The object of this additional resistance is to cause all the current from the battery to flow through the operating appliances, to the exclusion of the coherer after it has accomplished its initial function.

The antenna Guarini employs is made of a cable of seven wires, 9 mm. in diameter each (Fig. 3), with a cylindrical extension 33 feet long made of 50 parallel wires, having a cross section of 50 centimeters.

In 1900 Guarini submitted to the Academie des Sciences of Paris his theory that the antenna radiates electric waves exclusively in planes normal to its surface. He has written extensively on the role the antenna plays in the emission of waves as well as the role of the earth.

Guarini received the help of the Belgian government in his experiments and was assisted by Artillery Lieut. Ferdinand Poncelot. In Brussels the antenna was attached by bamboo poles to the Column of Congress; at Malines to the tower of St. Romhaut, and at Antwerp to the tower of Notre Dame. The antennæ were 90 feet in height.

The subject of wireless transmission is a fascinating one, but is yet in its incipiency, its possibilities practically unlimited, yet with such improvements for rapid and long distance telegraphy as the Delaney, the Mercadier and the Pupin systems, much improvement must be in order before the securities of the air wire companies will begin to decline.

Narberth, Pa., January 8, 1902.

Antarctic Explorations.

On the evening of February 17, 1902, at the Waldorf-Astoria Gallery in this city, under the auspices of Major J. B. Pond, C. E. Borchgrevink, the Norwegian explorer, gave an entertaining lecture illustrated by views made by himself of the first exploration of the Antarctic continent undertaken in 1898-1900, which was backed up by English capital.

The experiences were similar to those of the Arctic regions. In winter (there in July), the thermometer would average 72 deg. below zero, southeast gales were prevalent and would arise, accompanied at times with snow, very suddenly and prevail with great velocity. The land he discovered appeared to be of volcanic origin, was very precipitous, rising five to six thousand feet or more above the sea level, and on the top very little snow was found. The extreme south latitude he reached was 79 deg. 85 min., and views here showed icebergs and glaciers of tremendous size and of strange appearance. He described the breaking off of an iceberg from a glacier which was so immense that in its sudden immersion a great wave resulted which temporarily submerged him as it washed up against the shore where he was standing.

The seals and penguins were in abundance and very friendly. The penguins enabled him to determine in advance when a southeast gale was approaching, as he observed they all turned their heads in that one direction long before it arrived.

He described the method of fishing through the ice without bait, and secured specimens of new species of fish. He took with him two Laplanders and many Esquimaux dogs; these he found very serviceable in making short sledge expeditions from the base of supplies.

In the Antarctic winter the same brilliant electrical display appeared in the southern heavens that is observed in the Arctic region. Referring to the movements of immense icebergs he noticed they would go many times in a direction opposite to the surface tide and against the wind, showing that there must exist a deep counter undercurrent. He traveled two thousand miles south of Queensland, Australia, in a steamer named "The Southern Cross," landed on an island there, erected special houses and lived there with nine others, allowing the steamer to return. The vessel called for them again in 1900 and brought them home.

Work in the Field of Wireless Telegraphy.

News comes from London that it was decided at a meeting of the Marconi Wireless Telegraph Company to transmit words and messages across the ocean during the next series of experiments.

Marconi, who was present at the meeting, announced that there was nothing to prevent his company from more widely introducing his system of telegraphic communication at sea. At the present time the Marconi system is in use on some seventy ships. About twenty-five land sections have been established. A speed of transmission of about twenty-two words per minute has been obtained; the work of the cables is not very much faster. With his syntonic system Marconi hopes to secure that absolute secrecy, the lack of which has been one of the most formidable criticisms leveled at wireless telegraphy. So confident is Marconi of his ultimate success in attaining this end that he publicly challenged Sir William Preece and Prof. Lodge, both of whom are well-known investigators in the same field of research, to "tap" his wireless messages.

In Germany the Slaby-Arco system of wireless telegraphy, which is a modification of Marconi's, is rapidly being introduced. The German Navy Department has decided to establish a chain of wireless telegraph stations along the entire German coast. Up to the present time thirty-two German warships have been fitted with the Slaby-Arco apparatus. The number will soon be increased to forty. In Germany it is claimed that the improvements of Prof. Slaby and his intimate friend and collaborator, Count Arco, have done much to increase the distance through which the Hertzian waves can be transmitted. The claim is open to some criticism.

International Congress of Americanists.

The Thirteenth Session of the International Congress of Americanists will be held in the halls of the American Museum of Natural History, New York city, October 20 to 25, 1902. The object of the Congress is to bring together students of the archæology, ethnology, and early history of the two Americas, and by the reading of papers and by discussions to advance knowledge of these subjects. Communications may be oral or written, and in French, German, Spanish, Italian, or English. All debates are expected to be brief, and no paper must exceed thirty minutes in delivery. The papers presented to the Congress will, on the approval of the Bureau, be printed in the volume of Proceedings. Members of the Congress are expected to send, in advance of the meeting, the titles, and, if possible, abstracts of their papers to the General Secretary. The subjects to be discussed by the Congress relate to: I. The native races of America, their origin, distribution, history, physical characteristics, languages, inventions, customs, and religions. II. The history of the early contact between America and the Old World. All persons interested in the study of the archæology, ethnology, and early history of the two Americas may become members of the Congress by signifying their desire to Mr. Marshall H. Saville, General Secretary of the Commission of Organization, American Museum of Natural History, New York. Mr. Morris K. Jesup is president and the Duke of Loubat vice-president of the Commission of Organization.

The Current Supplement.

The first article in the current Supplement is devoted to the Madonna San Antonio, purchased by Mr. J. P. Morgan. An illustration of the picture in question accompanies the article. "The Naming of Our War Vessels" is continued from the last Supplement. A new method of water sterilization by means of ozone will undoubtedly be of interest to sanitary engineers. Major P. Cardew discourses very lucidly and entertainingly on polyphase electrical railways—a subject of which only too little is known in this country. "The Mechanical Handling of Baggage" is the title of an article describing a new installation in Paris. Prof. W. F. Watson has an illustrated description of a darkroom, the ventilation of which is all that can be desired. William T. Hornaday, of the New York Zoological Garden, has an article on the Mountain Sheep of North America; two illustrations accompany the description. The usual consular and trade notes will be found in their customary places.

Dr. Sven Hedin announces that he was attacked by Thibetans during his recent journey, and that all of his collections and almost the whole of his caravan was lost, but fortunately he was able to save his notes.