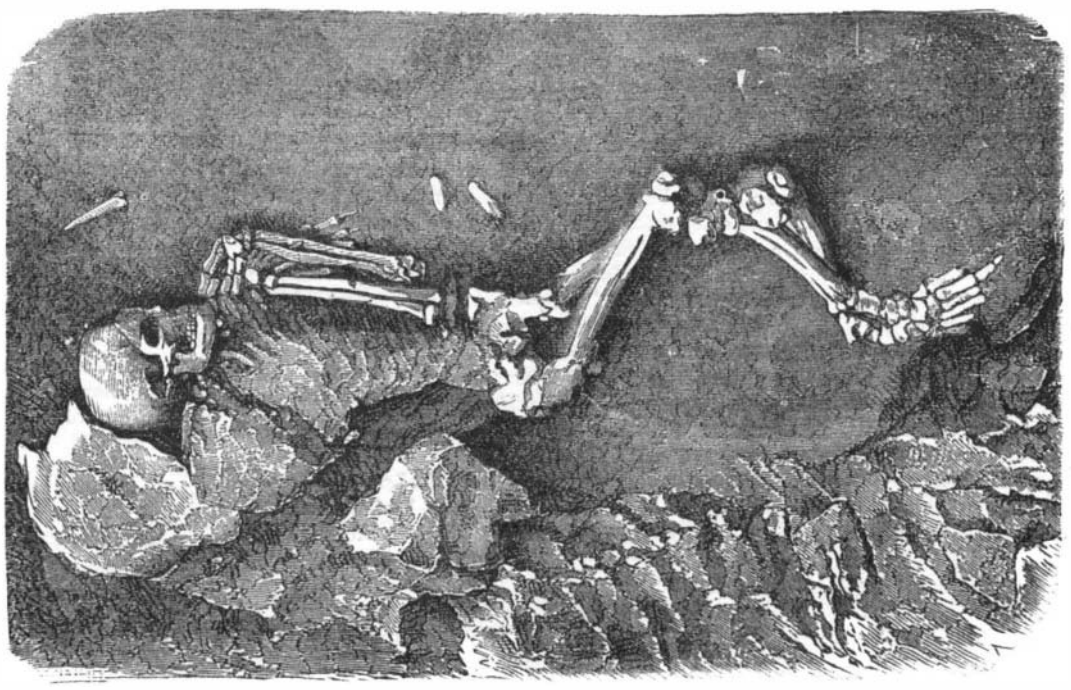
THE FOSSIL MAN OF MENTONE.

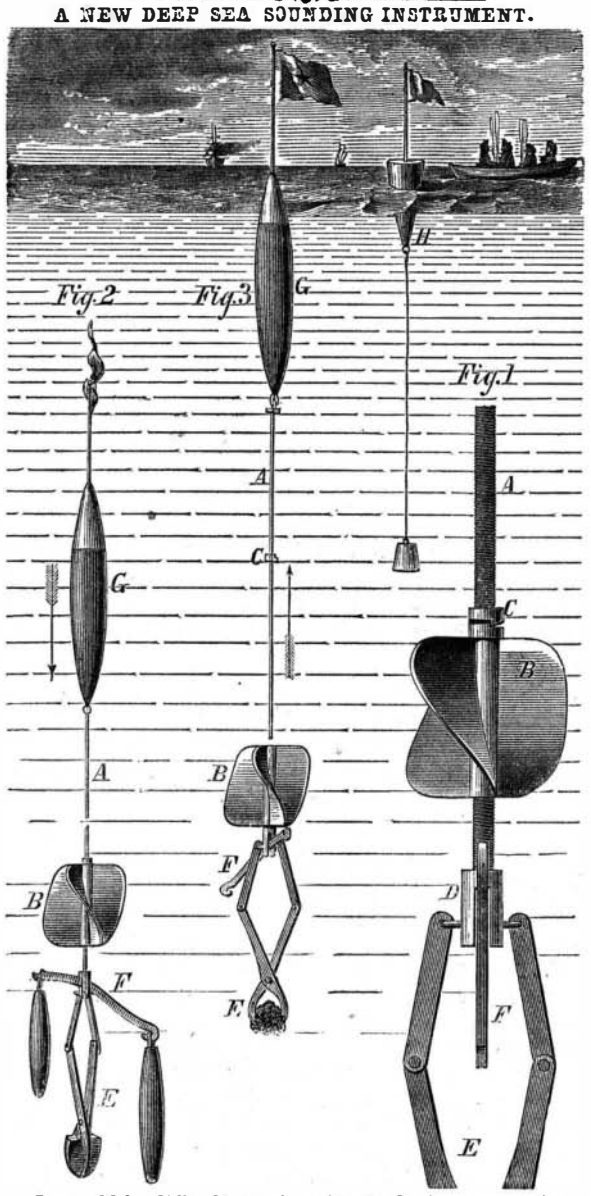
The discovery of a human skeleton in one of the grottoes of Mentone, a village on the south coast of France, near Nice, has produced for some time past no small excitement in the scientific world. The cave in which it reposed is hollowed in the garumnian limestone immediately below the nummulitic tertiary deposit so well developed in the vicinity. Some large imbedded rocks, probably post-eocene, gave rise to the natural excavation.

It appears, from the recent investigations of M. Rivière, that, at the upper portions of the caverns examined, remains of instruments and tools were found, belonging to the prehistoric epoch which immediately preceded, in the west of Europe, the appearance of metals. Below the surface, beds abound, remains of human industry indicating a civilization even more primitive than the antiquity assigned them by the superposed masses. In this locality was discovered, at a depth of 21 feet, the famous human skeleton depicted in our engraving. The earth was evidently in virgin condition, and hence the remains clearly belonged to the geological and palæontological age of its surrounding deposit. While, however, the fauna discovered in connection with the human relics indicate a very ancient palæontological epoch, the bone and stone instruments, and especially the necklace found on the skeleton, seem to point to a more recent period. The presence of cave bears and hyenas, the *rhinoceros tichorinus*, and *bos primogenius*, evidently relate to the most ancient quarternary epoch, the age of the bear; while, on the other hand, the abundance of remains of deer of various species and of small hight (chamois especially), the fact of the multiplicity of bone tools, needles, chisels, and a *baton* of command, together with the peculiar necklace which closely resembles that found on the fossil man of Cra-Magno, lead to the conclusion that the series of objects belongs to an age posterior to that of the bear, namely, to that of the reindeer. It is believed, however, says Dr. Garrigou, in *La Nature*, that the original owner of the skeleton existed during the latter age, and was buried in a cave formerly inhabited by men of the preceding epoch.



THE FOSSIL MAN OF MENTONE.

A NEW DEEP SEA SOUNDING INSTRUMENT.



It would be difficult, we imagine, to devise a more simple and inexpensive apparatus for deep sea sounding than that represented in the accompanying illustration. There is no intricate mechanism, no series of wheels or dials requiring careful adjustment, and not even a line; nothing, in fact, essentially more than a piece of metal wire, screw-threaded from end to end, and a fan working thereon rotated by the motion of the machine. The screw is cut to a certain pitch, so that the descent of the apparatus must be through a fathom of water to cause the fan to make one revolution. The further the instrument travels down, the higher the fan will climb up the rod. As soon as bottom is reached, and the machine begins its ascent, the fan (of course acted upon in a different direction) runs down the screw, but a messenger on the latter, pushed up by the fan, remains at and indicates the highest limit attained. It is only then necessary to pick up the apparatus when it comes to the surface and observe the distance that the messenger has been carried up, and the depth in fathoms is infallibly told.

Compared with the intricate systems for sounding carried by such vessels as the Challenger, and in other marine exploring expeditions, the present device is a marvel of simplicity and cheapness. It can be made on board, with the tools ordinarily found in the engineer's department of a steamer, or, at most, with one special instrument for cutting the screw thread upon the wire. The remainder of the apparatus is a block of wood or other light material for a lifting buoy, the grapplers which bring up specimens of the bottom, and a watch buoy. By noting the time of descent, together with the bearing and distance of the watch buoy from the point at which the machine rises to the surface, the bearing will show the difference of direction between surface and submarine currents, and the distance, the velocity. Thus, in the single instrument, is afforded a means of determining depth, character of bottom, and set and rapidity of currents.

The credit of this very ingenious invention is due to Captain Truman Hotchkiss, of Stratford, Conn., a gentleman of large maritime experience, to whom we are indebted for the substance of the detailed description which follows.

From Fig. 1 the particulars of the device will be understood. A is the screw threaded rod, made of brass or steel, and B is the fan, boxed and tapped to travel thereon. C is the messenger, traveling on the screw and fitting the upper end of the fan by a coupling so as to be moved by the fan only up the screw. At D is a socket screwed to the lower end of the rod, A, which carries the grapnel, E, the latter hanging to the bent end of a bolt which passes through the socket. This bolt also serves as a pivot for an unevenly balanced lever, F, Fig. 2, which passes through a slot at right angles to the plane of the grapnel. The upper end of rod, A, hooks in an eye on the bottom of the lifting buoy, G. H is the watch buoy, provided with anchor and flag.

Fig. 2 shows the machine descending and also the mode of adjusting it. It will be observed that the arms of the lever, F, differ considerably in size, and that they are provided with hooked ends, the curve on the arm on the right turning downward, and that on the left arm in the opposite direction. By this means the two weights represented are supported, one weight, the heavier, extending down to about the level of the bottom of the grapnel. The latter of course remains closed, as is evident from its form. The fan and messenger are then carried down to the bottom of the rod; and thus adjusted, the machine is let go, the watch buoy being previously carried to the place of descent. The time is then noted and a careful watch kept for the return of the apparatus. In descending, the rotating fan climbs up the screw, carrying the messenger with it; and the weights, overcoming the lifting power of the buoy, continue dragging the machine down until bottom is reached. At that moment the lower weight is lifted from its hook and drops clear, the smaller weight overbalances the lever and also falls off, and the jaws of the grapnel, opening against the resisting soil, grab a portion of the bottom. The lifting buoy now easily carries up the apparatus freed from the weights; and soon reaching the surface (Fig. 3), is easily recognized by the flag which it carries, blowing out clear.

The machine is then recovered, and the position of the messenger noted, as already described. As there are thirty-eight turns of the screw thread per inch of rod, it is only necessary to measure the distance in inches between the messenger and socket, D (*minus* the length of the fan), and to multiply the result by thirty-eight, when the depth in fathoms is at once known.

The machine may be made of any desired size; and in cases where the grapnel is likely to catch in seaweed or other obstruction, the power of the lifting buoy can be easily increased to tear away the hold.

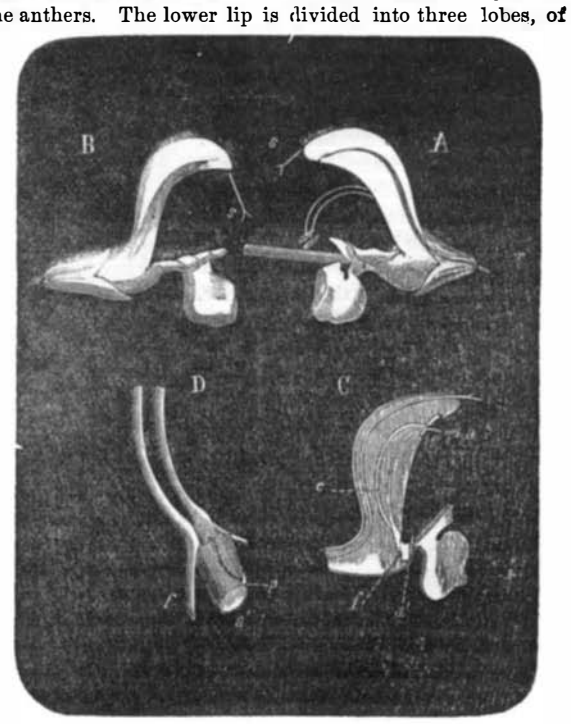
THE FECUNDATION OF FLOWERS BY INSECTS.

Among the numerous discoveries with which vegetable physiology has of late been enriched, none is more interesting or more curious than the part taken by insects in the development of flowers. The fact seems hardly credible, moreover, that, after all the theories which have been invented to explain the passage of the pollen to the stigma of the same flower (to explain which even the intervention of water, which is highly destructible to the pollen of terrestrial plants has been mentioned as possible), in the majority of cases the floral organs are so disposed as to absolutely prevent this contact, and that the pollen needs to be deposited on the stigma of a sister flower or even on a blossom belonging to a separate stalk.

Generally, when the pollen of a flower, through some means, accomplishes its self-fecundation, the result is a deleterious action upon the stigma, and the plant remains barren, as, for example, in many species of the genus *oncidium*. The aquatic plants, of which the pollen is transported by water, are few in number, while the pollen and stigma exhibit a peculiar disposition. With others (*coniferæ, gramineæ*), in some cases the wind carries the pollen, but the flowers are insignificant, destitute of nectar and of odor, and their pollen is in such great abundance that it has given rise to a fable, in certain countries, of a rain of sulphur.

Our attention, at present, however, will be directed to the flowers the pollen of which is carried by insects involuntarily from one blossom to another. Such flowers seem to appeal to the insect to enter their open leaves by exhibiting the brightest colors, and most beautiful and varied forms, besides secreting quantities of the nectar upon which their visitor subsists. Nothing can be more wonderful than the thousands of different shapes of corolla, of stamens, and of pistils; and yet all are arranged so as not only to cover the insect, in spite of himself, with pollen, but, at the same time, to separate completely the pollen and stigma of the same flower. Often the mechanical disposition of the various parts of the blossom and their play at the moment of the entrance of the intruder is extremely complicated, as Darwin has demonstrated in the case of many of the *orchidaceæ*; but there are other flowers of which the construction is easily understood and which are equally ingenious and surprising. One of the simplest is the sage (*salvia pratensis*) a very common plant of the *labiatæ*, or mint family, characterized by the existence of two stamens instead of four, portions of the flowers of which our illustration (extracted from the pages of *La Nature*) represents.

The corolla, A B, is deeply divided into two lips; the upper, which corresponds to two divisions of the corolla, turns backward in the form of an arch, and incloses the style and the anthers. The lower lip is divided into three lobes, of



which the middle one is large and concave; while those on the sides are smaller and roll from within outwards. The tube of the corolla is somewhat crooked at the base, and this crook or depression contains the secreted nectar. Of the peculiar form of the stamens, a clear idea will be gained

from Figs. C and D. In C the corolla has been cut longitudinally so as to leave the stamens intact. In Fig. D, a portion of the stamens is shown separately. The anthers have a long connective astride the filaments. The latter are very short, and are inserted in the sides of the tube of the corolla, *f*, in Fig. C and D. One anther, *a*, is developed regularly; the other, *a'*, is transformed into a flattened appendix, nearly rectangular, slightly curved, and convex outside. These two organs are so placed together as to form a kind of spoon, which very exactly closes the tube of the corolla. They even adhere quite strongly by their anterior points. The connective, which is almost unapparent on the inferior side, is elongated on the upper portion into a delicate arched filament which carries at its extremity the only pollen-enclosing cell of the anther.

If it be attempted to push a needle or bit of stick into the tube of the corolla, the little spoon, *a'*, will just be encountered. By a light effort, the connectives are turned around the filaments, when the fertile anthers, concealed under the superior lip, project themselves forward and deposit their pollen upon the intruding instrument. On withdrawing the latter, the elasticity of the filaments carries the anthers back under the upper lip. Up to the time when the pollen is ripe, the style, which is also concealed at the bottom of the upper lip, does not arrive at complete development and the bifidal stigma, *s*, hardly extends beyond the corolla, Fig. A. In the advanced flower, deprived of its pollen, the style elongates downwards and carries the stigma at the level of the entrance of the tube (see *s*, Fig. B).

It is now easy to follow the action of the flower, when a bee, for instance, visits it. The insect alights upon the lower lip of the corolla, and, to reach the hidden nectar, tries to penetrate the tube. But this it cannot do without, as already shown, pushing before it the short branches of the two levers formed by the connectives. At the same time the arched upper parts advance and embrace the body of the bee, applying the open anthers to its abdomen so that the insect emerges covered with the fine pollen. As long as it seeks the nectar of flowers of the same age as that just left and of which the styles are still very short, the stigmas can receive but little pollen; but when the bee attempts to enter an older blossom than B, the elongated stigma grazes along its back, rubs off the pollen, and thus becomes fecundated. Since the pollen of the *salvia* is deposited on the back of the insect, it is evident that little can be given to a flower of another species the construction of which requires the placing of the substance upon the head or trunk. While whatever may be the flowers which the bee visits before entering another *salvia*, the pollen with which it is charged is not rubbed off or wasted as it remains intact until a proper blossom is entered.

UP THE AMAZONS.

No. 2.

VOLUME OF THE GREAT RIVER AND ITS TRIBUTARIES.

The Amazons is the most voluminous of rivers. At the narrows of Obydos, six hundred miles from the sea, half a million cubic feet of water pass any given point every second. Born in Lake Lauricocha, among the Andes of Peru, the main trunk runs northerly for five hundred miles in a continuous series of rapids; and then, from the frontier of Ecuador, it flows easterly, twenty-five hundred miles across the great equatorial plain of the continent. The average current of the Great River in its passage through Brazil is three miles an hour. At Tabotinga, two thousand miles from its mouth, the width is a mile and a half, with a depth of eleven fathoms; at the entrance of the Madeira, it is three miles wide, and below Santaren, it is ten. The tributaries are in keeping with this colossal trunk. In fact, the Amazons is a great river system, rather than one river. It has twelve affluents over a thousand miles long, the largest, the Madeira, equaling the Arkansas, entering the Amazons nine hundred miles from its mouth.

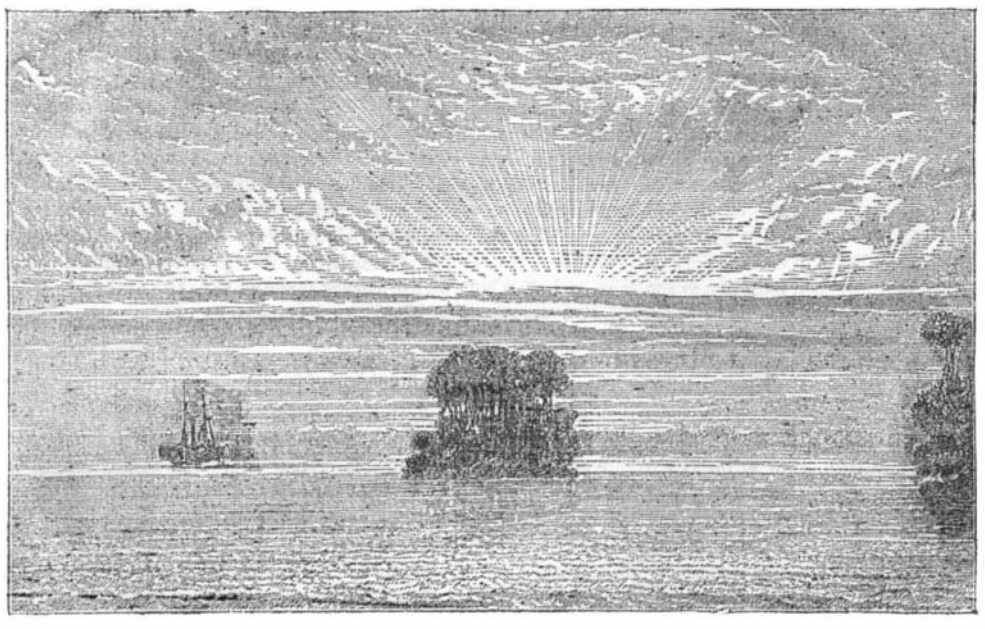
Besides these and a host of minor tributaries, there is a wonderful network of natural canals alongside of the main river and joining the tributaries, called *igarapés*, *paranás*, and *furos*. These bypaths are of immense advantage for intercommunication. They are characteristic of the country, and are so numerous that Amazonia is truly a cluster of islands. Altogether, this vast inland fresh water sea drains a territory of two million square miles, reaching from the Andes to the Atlantic and throwing out its arms to the Orinoco and Paraguay. On the Lower Amazons, the annual rise reaches its maximum about the middle of June, and its minimum in December, the difference of level being about fifty feet.

EXTENT OF NAVIGATION.

No other river runs in so deep a channel to so great a distance. No other river can furnish over six thousand miles of continuous navigation for large vessels. For two thousand miles from its mouth, the main stream has not less than seven fathoms of water; and not a fall interrupts navigation for twenty-five hundred miles. The Pongo de Manseriche is the western limit to navigation on the Amazons proper. While the current is ever east, there is a constant trade wind westward, so that navigation up or down has always something in its favor. In August and September, a strong breeze sweeps up the lower part of the main trunk, so that schooners often go from Pará to Obydos in ten days, or one third of the ordinary time.

As to the tributaries: the first in order, the Tocantins, could furnish a natural highway to the rich province of Minas Geraes, were it not for rapids one hundred and fifty miles from its mouth. This interruption will some day be circumvented by a railroad. Above the falls, a steamer can go six hundred miles. The Xingú is navigable nearly one hundred miles. From Santarem, steamers ascend the broad Tapajós about sixty leagues, to the rapids of Itaitúba; and passing these, traders go by canal to Diamantino and Cuyabá on the confines of Paraguay. From Itaitúba, there is communication *viâ* Manes with the Madeira. Near Obydos enters the Trombétas, navigable one hundred miles. And just beyond Serpa, the great Madeira pours its flood of waters. This majestic tributary is about two thousand miles long, one branch rising near Lake Titicaca, a second starting within fifteen miles of the source of the Paraguay, and a third washing down the gold and diamonds of the Sierras. It has a three mile current, and at its mouth is two miles wide and sixty-six feet deep. It is navigable to San Antonio, a distance variously estimated from five to seven hundred miles. Here begins a series of rapids, nineteen in number, having a total fall of thirty-eight fathoms; above which a steamer can ascend to Santa Cruz, in the heart of Bolivia. Colonel Church, who sounded the Marmoré for six hundred miles above the rapids in October (the dry season), found nowhere in midchannel less than fifteen feet of water, an average current of two miles an hour, and a width varying from six to twelve hundred feet. A railway around the formidable rapids which separate Bolivia from the Lower Madeira is now in process of construction by the Madeira and Marmoré Railroad Company. The track extends from San Antonio to Guajarámirim, a distance of one hundred and eighty miles, and by the terms of the contract the road is to be finished in April in 1874. This is one of the most important enterprizes on foot; but great difficulties have been encountered, as the scarcity of laborers, the attacks of Indians, and the prevalence of epidemics. The company, however, in spite of all obstacles, declare that this great connecting link must and shall be built. As soon as completed, the National Bolivian Navigation Company will be ready to put a fleet of steamers and barges on the Marmoré and Guaporé. Both Brazil and Bolivia are interested in this railway, and have conceded to the company over one million acres of territory along the line. The affluents of the Madeira water a region as large as the basin of the Nile and nearly as rich. The valley of the Beni above is famous for its gold, Peruvian bark, coffee, and cacao, which now have to climb the mountains of La Paz and cross to the Pacific.

One hundred miles west of the Madeira enters the Rio Negro, which is navigable to San Gabriel; but at present steamers go only to Santa Isabel, or five hundred and forty-six miles. It is a deep though sluggish river, the depth at Manáos at high water being forty-four fathoms. Steamers, therefore, do not usually cast anchor, but fasten to buoys. The Rio Branco branch can also be navigated by small steamers for sixty leagues. Above the rapids of San Gabriel, the Negro is connected by the Cassiquian with the Orinoco; and hence the commerce of this part of the river is naturally in the hands of Venezuelans.



MOUTH OF THE AMAZONS

Next in order is the Purús, one of the most promising tributaries of the Amazons. Recently opened to the world by the daring Chandless, this hitherto mysterious river, possessed by the untameable Chunchos, has suddenly become one of the most attractive and valuable streams in the world. Rising in the richest part of the Andes and entering the Amazons only forty-five leagues above the city of Manáos, it is navigable for steamers, the greater part of the year, for over twelve hundred miles. At the distance of eight hundred miles from its mouth, the depth is never less than twelve feet. It is nearly, if not fully, equal to the Madeira in size, but is exceedingly winding in its course. Parallel to the Purús is the almost equally important Juruá. It is navigable, for steamers drawing three or four feet of water, for fifteen hundred miles. Like the Purús, it is a very crooked river, and has a two and a half mile current. Five hundred miles from its mouth, it has a depth of two fathoms at low water.

The Jutahi and Japurá are first class tributaries; the latter is navigable for ten days by steamer, when falls are reached where there is a lofty table-topped mountain. The Icá has no rapids and is navigable into New Granada. It is a healthy river, and is of considerable commercial value. The Jávari is navigable for an unknown distance, and is called the "Golden Dream of the Peruvians," who think it is the eastern outlet of their country. The Napo could be ascended by a flat bottom steamer five hundred miles; it is the natural highway eastward for Ecuador. The noble Ucayáli has been navigated by a steamer of five hundred tuns for six hundred miles in the dry season; and a small steamer has ascended over seven hundred miles, or within two hundred miles from ancient Cuzco, and three hundred from Lima. There is twenty feet of water at Sarayacu. The Ucayáli will undoubtedly connect Lima with the Amazons. Finally, the Huallága has an average depth of three fathoms for a hundred miles; but canoe navigation begins at Tingo Maria, one hundred and twenty miles from Huánaco. Such are the vast capabilities of this gigantic river, fitly called the Mediterranean of the New World.

THE NATURAL WEALTH

of the country is in proportion. No spot on the globe contains so much vegetable matter as the Valley of the Amazons. Within it we may draw a circle of eleven hundred miles in diameter which shall include an evergreen, unbroken forest of grand and beautiful and valuable trees, in endless variety. In truth, it is this very excessive exuberance which offers the chief obstacle to settlement. We know next to nothing of the interior; but the margins of the main trunk and especially of the tributaries abound with precious woods, drugs, dye stuffs, edible fruits, and other useful products. Among the most important of these for exportation are: Moira, pinima, moira piránga, moira coatiára, itaúba, palo di sangre, massarandúba, sapucáya, jacaranda, cedar, and cumarú; salsaparilla, vanilla, cupaiba; cinchóna and guaraná; cacao, coffee, tonka beans, nuts, farina, tapioca, cotton, rice, tobacco, and sugar; rubber, piassába, pita, and copal, and a host of others unknown to commerce.

SAILING CRAFT AND STEAMERS.

The present traffic in the riches of this inexhaustible region is far behind the world's expectations; but it has wonderfully increased since the introduction of steamers in 1853. It is impossible to ascertain the number of sailing vessels on the river; but the variety is extraordinary, for the Indian is a carpenter and shipwright by intuition. Thus we see: First, the *canoe* proper, or "dug out." Second, the *montaría*, a small boat made of five planks, or a canoe increased by two narrow boards for the sides and small triangular pieces for stem and stern. The paddle serves for both steering and propelling. Third, the *montaria-possante*, a large montaria with oars. Fourth, the *igarité*, a large canoe or montaria with two masts, rudder, keel, and palm leaf awning or cabin near the stern. Fifth, the *galiota*, an igarité with wooden covering. Sixth, the *cobérta*, a large galiota with one or two wooden cabins. Seventh, the *vigilengas*, a large igarité, short and broad, flat bottom with keel fore and aft, first made at Viges. Eighth, the *batelao*, a barge with square sails but no deck, to carry cattle; sometimes propelled by long oars. Ninth, the *barco*, a batelao with deck. Tenth, The *escuna* or schooner.

Of steamers there are now thirty-five afloat on the Amazons, varying in tunnage from seventeen to eight hundred and sixty-four. The aggregate tunnage is over ten thousand. Twenty of these belong to three companies, which receive a large subsidy from the Government and have a total capital of $3,600,000. The oldest and most powerful line ("*Companhia de Navagaçao a vapor de Amazonas*") is owned in London, but is under the management of the distinguished and energetic Sr. Pimeuta Bueno, of Pará. This company is endeavoring to swallow up the other two, having just purchased the Paraense line and nearly completed negotiations for the Fluvial, and thus monopolize the carrying trade on the river. Officially made free to the world in 1867, the navigation of the Amazons is virtually restricted to the Brazilian flag. Foreign vessels may go up the main river as far as Manaos; up the Tapajos to Santarem; and up the Madeira to Borba. On the Maranon the Peruvian government has two large steamers, doing monthly service, besides several small ones for the tributaries; and an English firm at Iquitos has recently inaugurated a private line between that point and Pará. Goods for Peru pass Pará free of duty. Two regular steamers leave Pará for Manaos and intermediate points, on the 2d and 18th of each month, and a monthly steamer plies between Manaos and Loreto, on the Brazilian frontier, connecting with the Peruvian Morona for Yurimaguas on the Huallága. The other steamers run from Pará and Manaos to numerous villages along the main river and the tributaries. The navigation of these tributaries, but