THE WONDER HUNTERS.

Progress of the Agassiz Geological, Archeological, Paleontological, Sounding, Dredging and Impaling Expedition.

Talcahuano, Concepcion and Juan Fernandez, Valparaiso and Callao.

THE HOME OF ROBINSON CRUSOE.

Horrors of the Grave Yards of Santiago.

A FIRST VIEW OF THE ANDES

Scientific Scrapings from the Ocean Bed, Botanic Grubbings from the Land, and Savant Chippings from Old Stones.

UNITED STATES COAST SURVEY STEAMER HASSLER, VALPARAISO, Chile, May 11, 1872.

It was late in the afternoon of April 11 when we reached our anchorage in Concepcion Bay, opposite the little town of Talcahuano. We had been looking forward for a long time to our arrival at this port, the first one after many weeks spent either at sea or in wild, savage regions where we could expect to receive letters from home or enjoy the pleasures of civilization, and where many of our party hoped to see old acquaintances and renew old friendships. It was a lovely afternoon, and as we rounded Tumbes Heights and stood in the harbor—the finest on the western coast of South America—seemed especially attractive, partly from its intrinsic beauty and partly, no doubt, from our personal anticipations and from the historic interest attached to many of the points presented to our view. The bay is about six miles long by four wide, containing one large island and a few shoals, but affording well sheltered anchorage ground at nearly every point. Talcahuano is situated at its southwest angle, and we steamed toward it near the western shore, along which runs a range of hills, eight hundred or one thousand feet high, continuous with those lining the coast for many hundreds of miles, their rounded slopes being apparently well cultivated. To the east we could see the towns of Tome and Penco, as clusters of white dots at the foot of green hill sides, and ahead the low houses and solitary spire of Talcahuano began to draw into view as we neared our destination. The whole scene was very quiet and peaceful, but it was the arena in which had occurred, on more than one occasion, a terrible contest of the elements. About a century and a half ago the seaport and capital of the province of Concepcion was situated at the point where the little village of Penco now flourishes. It was

ONCE OVERWHELMED BY AN EARTHQUAKE WAVE.

In 1730 and in 1751 its successor was destroyed in a similar manner. After these two calamities the site of the town was removed to the right bank of the River Bio-Bib, about nine miles from Talcahuano, which became its seaport, and the present city occupies the same position. A period, if not of quiet, at least of comparative security followed these disasters, until on the 20th of February, 1835, a convulsion occurred, which rivalled its predecessors in destructive effects, and which is still spoken of with horror by many who witnessed it. On the morning of that day great numbers of sea fowl were seen to pass over the city towards the interior, and it was noticed that the majority of the mongrel homeless curs, usually abundant in the streets, had left the vicinity. These facts seem to have been recorded by credible and reliable observers, and have since been regarded as indicative of the premonition of these creatures in some incomprehensible way of the approach of danger. A little before noon a slight shock was felt almost simultaneously in Concepcion and Talcahuano, but gave little alarm to a majority of the inhabitants, accustomed to almost daily evidence of the instability of the crust on which they were living. It soon, however, increased terribly in violence, buildings waved and tottered, individuals were unable to stand upright, the heat became stifling, dust arose in blinding, smothering clouds, and in a few minutes both cities were in ruins, hardly a half dozen houses remaining intact. At Talcahuano nearly the whole population sought refuge on the hills from the wave, which they rightly anticipated as a result of the shock. The sea had retired, until vessels which had been anchored in seven fathoms of water were aground, and every rock and shoal in the bay was exposed. In a little while an enormous mass of water was seen rushing in from the ocean through the narrow passage between Quiriquina Island and the western shore, uprooting trees on the banks, tearing ships from their anchorage, and finally overwhelming the town. It soon receded, carrying with it everything not buried beneath the ruins and leaving the vessels again aground. It was succeeded by a second and then by a third, augmenting in size and violence. Two immense waterspouts, followed by whirlpools, were seen in the bay, which became black and sulphurous; thousands of dead fish were thrown ashore; gas and water boiled up and escaped in the midst of the town, and these disturbances continued until, as described by Captain Fitzroy and Mr. Darwin, they ceased as though from actual exhaustion. This earthquake was felt at all points between Chiloë and Copiapó and Juan Fernandez and Mendoza. During the next two weeks more than three hundred distinct shocks were experienced by those who remained on the spot, endeavoring to rebuild their fallen habitations or seeking for lost treasures, either carried out to sea or buried beneath heaps of rubbish. It was many years before the traces of this disaster were removed, though since then another interval of calm has followed. Such were the events which had

OCCURRED WITHIN FORTY YEARS

in the locality where a placid expanse of water, sunny hill sides, fertile fields and luxuriant forests seemed to deprecate any association, even in our thoughts, with scenes of violence and destruction. As soon as we dropped anchor we received the customary visit of inquiry and inspection, then others, not customary unfortunately, reuniting friends and relatives after a long separation, and then the arrival of our mail bringing nothing but good news and plenty of it, completed the pleasure of the day.

We were detained at that port a fortnight while the machinery was undergoing repairs, it being necessary to have a new reversing quadrant cast in place of the one which had broken while we were in the straits. It gave us a very welcome opportunity of becoming acquainted with the surrounding country and of prosecuting the usual scientific work, and in the latter direction much more was done than had been anticipated. A vacant dwelling was secured as the headquarters of the scientific corps, at a cost which would seem ridiculously small in the States, and our apparatus for zoological, photographical and other work were taken there. Scarcely was it known what were the articles desired by Professor Agassiz when every idler—and there are many—every school-boy who could escape his task, every old, decrepit dame who could hobble about, every lazy half-breed or tipsy waterman—in fact, every one who ordinarily had no visible occupation constituted himself an attaché of the Professor, and he and his assistants were

HARDLY ABLE TO WALK THE STREETS IN PEACE,

so beset were they with importunate caterers to the museum of comparative zoology. At first, in consequence of the novelty of the traffic, the prices asked were fabulous, but eager competition and abundant supplies soon brought them to a normal level, and great numbers of specimens of all kinds were secured. The town of Talcahuano has one principal street parallel to the shore of the bay, a row of offices for public business, which front on a fine mole; a church, a plaza and a railroad depot. The houses are all of one story and in the form of a hollow square, having in the centre a court-yard, on which most of the rooms open. Those of the lower classes are built by nailing rows of slates on both sides of posts set in the ground, filling in between the slates with brushwood or other waste material, and plastering the outside with mud, or in some cases with stucco. The frequency of earthquakes has undoubtedly had its effect upon the architecture of the country, as it has been asserted to have upon the minds and even the morals of the inhabitants; but there was none of the squalid appearance mentioned by former visitors. In the poorer quarters here, as at home, there are filth, misery and degradation; but in the houses of the wealthier and more intelligent, although there is an absence of exterior decoration, were found invariably a degree of refinement and elegance, almost of luxury, rare with us except in large cities. As to our

PERSONAL RECEPTION AND TREATMENT,

nothing could have been more kind, more attentive or more hospitable, and there was a degree of cultivation and lack of provincialism which would be anomalies in a town of the same size in the States. The population, of about four thousand, probably has the same distinctions and contains the same elements as in the larger South American cities, with perhaps a little less admixture of the American and English element. The three prominent classes are:—The descendants of the old Spaniards, who constitute the upper stratum of society; a middle working class, corresponding to our laborers; and half-breeds, usually holding menial positions, and resulting from the union of the preceding class with the native Indians. These half-breeds have many distinct and interesting physical characteristics, and some time was spent in obtaining photographs of those who showed them most markedly.

CONCEPCION WAS VISITED FREQUENTLY,

the ride between it and Talcahuano being one of our chief forms of amusement. The road is about nine miles long, straight, broad, and, except in a few places, quite firm. It passes through a wide plain covered with baldos bushes and then runs for several miles between cultivated fields. One of the frequent sights along the road was a migratory Chileno family, travelling in an ox-cart consisting of a box set on two wheels made of solid blocks. Their advent would be heralded from afar by the shrill whistling and creaking of the rude conveyance, the sound of which was, however, equalled, if not exceeded, by the clatter of tongues arising from the women and children packed in the vehicle. A "*Como le va?*" was always answered politely, though rather too volubly for one with but a limited acquaintance with the language.

In front of the huts on either side of the road women and men were seated at work, the former picking out threads from pieces of muslin, so as to form the lace which they sell in the cities, the men making straw mats for the same purpose. Although there were none of those indications of prosperity common with us, no comfortable dwellings, commodious barns or neat enclosures, yet, on the other hand, there seemed to be no want of the necessaries of life, the children, as well as the parents, being fat and well nourished, though neither of them were remarkable for personal nicety. In Concepcion the houses are the same one storied, quadrangular buildings; the hotels are good and very inexpensive; the streets are all straight and do not err extremely on the score of either width or cleanliness, and the town has a general air of respectable mediocrity. There are a number of public buildings,

SCHOOLS, CONVENTS AND CHURCHES,

the latter being the most creditable in the way of architecture and decoration. The Alameda is a park on the eastern side of the town, the chief ornament of which is several rows of noble Lombardy poplars. It is now almost entirely neglected for the more modern and convenient Plaza in the centre of the town. On the streets the majority of the population seemed to consist of priests and policemen, both usually looking sleek and well fed. The influence of the Church, though still predominant, appears to be diminishing as modern education, leading to more liberal modes of reasoning and thinking, is becoming more common. It has not been long since an encounter took place at Concepcion between the spiritual and temporal authorities, which created so much excitement and has been the cause of so much political and religious controversy that, although insignificant in itself, it has, on account of the principles involved, become of great importance. A well known and popular military officer died, refusing to receive the attentions of a priest. The curate declared that his body should not be interred in the Catholic cemetery, he

HAVING DIED AS A HERETIC.

The Intendente of the province, however, insisted on his burial in the ordinary locality, and, having the requisite power, ordered the funeral to take place, and the remains, followed by a vast concourse, were deposited in consecrated ground. The curate appealed to the Archbishop, and the latter to the general government in a published address, setting forth many sins against religion and morality, of which, he said, the deceased had been systematically guilty. The matter was agitated in Congress, a resolution sent to the Executive asking that some action be taken, and the result was that in a short time a decree was issued authorizing the burial of every one, saint or sinner, believer or heretic, Jew or Mohammedan, in the consecrated ground, hitherto held sacred for the elect and redeemed. This, coming from a government said to have been established in a great measure by priestly influence, and striking as it does a blow at one of the fundamental institutions of the Church, is believed by many to be an unmistakable indication of the approaching downfall of a power which has always been a clog on the progress of the nation. Some of the characteristic dishes of the country are worthy of mention, as we certainly considered them worthy of much more material attention during our stay; but to attempt a description would be to do them the injustice of mentioning ingredients apparently incompatible, without being able to explain the skill which combines them, the only conclusive proof of their excellence being precisely similar to that of

THE PROVERBIAL PUDDING.

On the afternoon of April 25, our machine work being concluded and our new reversing quadrant in place, we got under way, after a little delay caused by the packing of our port anchor chain, and steamed out of the harbor, heading towards the northwest, for Juan Fernandez. We were going to sea for the first time since leaving Boston without female society, the two ladies who had added to the pleasure and lightened the care of the trip having remained behind—one to rejoin us at Valparaiso, the other at Panama. Professor Agassiz and Dr. Steindachner also stayed, intending to make an overland trip of a few hundred miles. We stopped several times to sound and dredge on our way out, but early on the morning of April 29 we

SIGHTED JUAN FERNANDEZ,

and by daybreak were quite close to it. The approach to the island is remarkable for its picturesqueness, and a nearer view adds greatly to its beauty, though if it were a mere sandbank it would have an intense interest from the atmosphere of mixed romance and reality surrounding it—remembrances of Robinson Crusoe and Alexander Selkirk, Spanish buccaneers and Chileno convicts, shipwrecks and earthquakes, caves, cannibals, tame parrots and goatskin umbrellas intermingling in one's thoughts. We were not, however, able to satisfy our desire to set foot on its shores for forty-eight hours, during which time we sounded and dredged in the vicinity of the island and also made various observations upon the action and penetration of light at different depths. It is now generally known and understood that associated with the ordinary illuminating rays of light are others, called the "actinic," or sometimes the chemical rays, which have distinct properties, being absorbed by various bodies not affecting the others, and especially exercising a decomposing action on certain chemical compounds, which action in the case of the salts of silver constitutes the basis of photography. As has been previously asserted of the illuminating rays, no facts whatever were known in regard to the presence or absence of this quickening and

VITALIZING FORCE IN THE DEPTHS OF THE OCEAN,

and whether these rays were absorbed or were transmitted far below the surface has been a question on which a few zoological facts alone threw a feeble and uncertain light. A novel and interesting experiment on this subject was made by the help of an extremely ingenious apparatus invented by Dr. Thomas Hill, ex-President of Harvard College. It consists of a small brass case containing the works of an ordinary Waltham watch. Covering this case and of equal size are two plates, the upper one corresponding in its motion to the minute hand of a watch, and having a crescentic opening around two-thirds of its circumference, the other fixed immovably and perforated by a small circular aperture, under which is a chamber for the reception of a coated and sensitized plate. Now, starting the watch at the moment when the opening in the upper plate is just about to uncover by its motion that in the lower, it is evident that during forty minutes, or two-thirds of the hour required by the flattened and expanded minute hand to make its circuit, light will be admitted through the revolving crescentic opening and the fixed circular aperture, and will penetrate to the surface of the sensitized plate. At the end of the two-thirds of an hour the unperforated portion of the upper plate comes over the lower circle and all access of light is shut off, and remains so for twenty minutes. Now, when in practical use, a plate is prepared in the dark room, and put in its place in the case during the interval of the absence of light; the whole apparatus is then deposited in a heavy iron cup, over which a piece of plate glass is fastened by a tightly fitting cap, and it is then sunk to the required depth, and the time noted. The process which takes place is as follows:—At the end of twenty minutes the upper opening comes over the lower one, and continues to pass slowly over it for forty minutes, during which time

WHATEVER RAYS HAVE REACHED THAT DEPTH

pass through the plate glass and the two apertures and produce their decomposing effect upon the sensitive film. At the end of that time, the light being shut off by the motion of the upper plate, the apparatus is withdrawn, carried to the dark room and the plate developed as in ordinary photographic operations. In this way we have been enabled by Dr. Hill's beautiful little apparatus to demonstrate the presence of actinic rays at comparatively great depths, and hope to continue the observations until enough shall have been taken to be presented in a tabulated form.

On the morning of May 1 we ran in and dropped anchor in Cumberland Bay, the harbor on the eastern end of the island, an open roadstead, much exposed to northerly winds, but safe and convenient when they do not prevail. Nearly opposite the centre of the bay rises for three thousand feet

A REMARKABLE FLAT-TOPPED MOUNTAIN,

the highest elevation on the island. It is called from its shape El Yunque, or The Anvil. On either side are lesser peaks, sharp and jagged, and between them are valleys filled with thick forests and tangled shrubbery, or beautifully green with grassy plains. The hill sides are covered with vegetation, which increases in luxuriance as you ascend; but those cliffs fronting on the sea are bare and rugged, and in many places descend almost perpendicularly from a height of one or two thousand feet, their surface affording neither shelter nor sustenance even to the wild goats.

Juan Fernandez is about ten miles long, three or four in width and is 360 miles from the mainland. Its history has been a most peculiar one. Discovered in 1563 by the Spaniard, from whom it takes its name, it presented sufficient attractions to induce him to apply for a patent and permission to settle there. The request being refused it came to be employed as a rendezvous for various lawless characters. Smugglers sought refuge there, buccaneers and pirates made it their hiding place and headquarters, and English adventurers—not on a much higher level morality—stopped there to rest and recruit until a favorable time arrived for sweeping down on the western coast to pillage and plunder. Their principal means of sustenance being the flesh of wild goats, the Viceroy of Peru caused large numbers of dogs to be introduced on the island; the majority of the goats were hunted down and killed, and a period of peace seems to have followed.

In 1681 a Mosquito Indian was left there, lived solitarily for three years and was then removed. In 1704

ALEXANDER SELKIRK

was landed from a Spanish galley and remained there alone until he was succored in 1709. It is to his story, as told by himself to Defoe, that we owe "Robinson Crusoe," perhaps the most widely-known of all works of fiction in all ages. It does not, it is true, adhere closely to Selkirk's narrative, and, indeed, the story, as written by Defoe, would place its hero on an island in the Atlantic, not far from the equator. Probably Tobago corresponds more closely than any other to the description given. It was, however, from Selkirk that Defoe first received the stimulus to undertake and the groundwork upon which to base the tale, which has made them both infinitely more famous then they would have been if Defoe had simply transcribed and published Selkirk's account. In 1741 Lord Anson landed on Juan Fernandez with the

REMNANT OF THE CREWS OF THREE VESSELS.

The scurvy was making frightful havoc among them, but the fresh food and mild climate of the island restored them all to health, and they went away to sing its praises. In 1751 a Spanish settlement was started there, but was soon destroyed by the great earthquake, and for a number of years subsequently the island was only transiently and irregularly inhabited. In 1819 a penal colony was established there by the Chilean government, but the prisoners growing too numerous rose on the troops and overpowered them. The expense of maintaining a military force strong enough to quell such insurrections was found to be so great that the island was again abandoned to solitude.

We had expected to find a German settlement there, but on going on shore we were met by an intelligent Chileno, who spoke excellent English, and who informed us that the island is at present leased from the Chilean government by a gentleman residing in Valparaiso. There are but twelve people in all now living there, whose occupation is the cultivation of the soil and the care of the live stock, which consists of some fine cattle and a few fowls.

THE WILD GOATS

were said to be as numerous as ever, but the dogs had been hunted and killed in their turn until there was but one poor solitary individual left on the island. Beef, vegetables and fresh milk are sold to vessels stopping for supplies, and especially to American whalers, who are the chief customers. During the twenty-four hours of our stay there everything was done in the way of collecting which was possible—fishes, crabs, shrimps and lobsters of various genera being obtained from the bay, a few birds from the hills, and a variety of mollusca along the shore. A shark of the family *acanthius* was harpooned by one of the officers from the stern of the vessel and was dissected and preserved. The whole island seemed to us distinctly volcanic, the rocks consisting of basaltic green stone and trap and covered with a scoriaceous lava, the decomposition of which has produced a moderately fertile but loose and crumbling soil. The botany was found to be of great interest, and resembled that of Chile much more than was thought probable from the direction of the prevailing winds and currents. We subsequently discovered, on more carefully comparing specimens, that it was only a resemblance, and that there were very few cases of identity of species. The dark foliage of the myrtle predominates on the hillsides, but fig, peach, cherry, apple and other fruit trees grow in abundance, and palms flourish on the summits, though they do not descend into the valleys. Wild oats, wild radishes, strawberry plants, mint, tree-ferns, lichens and mosses were also seen in great abundance, and parasitic vegetation seems to possess a luxuriance almost tropical. High up on one of the hills a bronze plate was found, fastened in the rocky wall of a mountain path, and bearing the following inscription:—

> IN MEMORY OF
> ALEXANDER SELKIRK,
> MARINER,
> a native of Laego, in the county of Fife, Scotland, who lived on this island in complete solitude for four years and four months. He was landed from the Cinque Ports, galley of ninety-six tons and sixteen guns, in 1704, and was taken off in the Duke, privateer, in February, 1709. He died lieutenant of H. M. S. Weymouth, A. D. 1728, aged 47 years.
> This tablet is erected near Selkirk's lookout by Commodore Powell and the officers of H. M. S. Topaz, A. D. 1868.

The most interesting spot on the island was the cave where Selkirk lived during his residence there—the Jerusalem of all devout believers in "Robinson Crusoe," and the spot which, more than any other, connects that wonderful story with reality. It is situated near the shore of a bay, about a quarter of a mile to the west of the harbor, and we were compelled to go to it by water. When we arrived there we found a heavy swell and surf beating on a rocky beach, and our landing was effected with considerable difficulty.

A SHORT WALK BROUGHT US TO THE CAVE,

which is in full sight from the shore, only a field of wild oats intervening. It is, perhaps, fifteen or twenty feet high, and as many deep, situated at the foot of a precipitous hillside and surrounded by thin clumps of a species of cane. It was somewhat of a disappointment to find that it did not correspond more closely to Robinson's description of his celebrated habitation, with its impregnable hedges, its second doorway of exit, its nooks for stowing his powder and other valuables, and its numerous ingenious contrivances for the comfort and safety of its distinguished occupant. Its situation, however, agreed more nearly with the fiction, and the plain—"not above a hundred yards broad and about twice as long"—which lay like a green before the door of Crusoe's cave, sheltered from the heat of the sun till towards its setting, and "descending irregularly every way down into the low ground by the sea side," might well have been that on which we looked. The place had been desecrated by

SACRILEGIOUS RELIC HUNTERS,

who had carved their names over its walls and chipped away great pieces of its interior, and it was black with smoke from the fires of three Chileno families who had recently inhabited it. These circumstances, however, did not dampen our ardor or lessen our enthusiasm, and, with the exception of one sceptical member of the party, who, disappointed at not seeing more evident traces of Robinson Crusoe, refused to believe even in Alexander Selkirk, we all left, feeling that the day had been one never to be forgotten.

Early on the following morning we stood out to sea and proceeded towards Valparaiso, with occasional stoppages for sounding and dredging. About four o'clock on the morning of May 5 we sighted the light on Angeles Point, and by daybreak were standing into Valparaiso Bay and enjoying our

FIRST VIEW OF THE ANDES,

whose grand chain was projected against the clear eastern sky. We were looking at last at mountains, not sand hills or stone piles, but mountains, and Aconcagua—the highest point on the American Continent, 6,000 feet higher than Mont Blanc and only excelled by the mountains of India—loomed up from the distance of 100 miles until he seemed close at hand. A dark cloud was perched, sombrero like, on his peak, until touched and made golden by the rising sun. On either side for 200 miles we could see ranges only slightly inferior to him in altitude and covered with perpetual snows far below our line of vision, though they seemed dark in their own shadows.

We dropped anchor about eight o'clock in our present station, where we have since remained awaiting the conclusion of some necessary repairs to the reeling engine.

In Valparaiso.

UNITED STATES COAST SURVEY STEAMER HASSLER, CALLAO, May 27, 1872.

After a short and pleasant run from Juan Fernandez we dropped anchor in Valparaiso harbor at daybreak on May 5. The bay is a shallow roadstead, entirely open to the north, and strong winds from that quarter are apt to do much damage to the wharves and shipping. The business portion of the city is built on a small strip of land lying between the water and the bases of the hills, while many of the private residences are perched on the sides of the latter at various elevations, so that it is not unusual to have to ascend one hundred feet or more by narrow, winding paths in order to reach them. The streets are kept in a state of scrupulous cleanliness, which contrasts remarkably with those of our principal cities, and the common spectacle of policemen enforcing municipal regulations, and actually assisting in the removal of waste materials from the highways, was one calculated to excite doubt, even in the mind of the most ardent lover of home institutions, as to the advantage of a Board of Health over an Intendente. The public buildings and the business edifices are many of them handsome, and are generally well and substantially built. There is less of the common tendency of South American cities to spread out laterally, owing, no doubt, to the very small portion of land which has been redeemed from the sea by the gradual rise of the coast. It is now generally believed that such a rise has been taking place for a long while, whether from a subsidence of the oceanic area, from the expansive power of imprisoned vapors, from the contraction of neighboring portions of the earth's surface, from tidal waves in an internal igneous fluid, or from any or all of the numerous forces which have been assigned as causes by geological speculators. Shells of recent or existing species are said to have been found strewn along the coast for thousands of miles, embedded in loose sand or mould on terraces and hill tops, and it seems evident that it has not been long since this portion of the American Continent was entirely submerged. The frequent changes of level which have taken place have doubtless produced corresponding changes in the climate and physical characteristics of the country. Before the Cordillera attained its present height the warm, tropical, easterly winds were not chilled and deprived of all their moisture by contact with its cold summits, and the whole region must have worn a different aspect under their fertilizing showers. Then, too, localized alterations have had their effect—rivers have been turned backward in their course, and plains covered with luxuriant vegetation have become barren wastes.

Ruined buildings have been found all through Chile and Peru in situations now the most unlikely to attract settlers—at heights where the snow never melts, in valleys where no rain ever falls and not even a streamlet irrigates the soil, and in places where the land is utterly unfit for any kind of cultivation. To those who first discovered them they were mysteries, and even the old tribes, some of whom yet live secluded far up in the mountains, know nothing of their origin. In the light of comparatively recent geological discovery it now seems probable that man must have inhabited this portion of our Continent for ages, that since those rude houses were erected the character of their surroundings has changed, and that possibly the whole of the present rainless region was once a veritable "valley of Paradise." The commercial prosperity of the city of Valparaiso dates from the establishment of Chile as an independent State, and depends partly upon its position as port of the capital and the natural outlet of fertile and wealthy tracts of land, and partly upon its central situation as a rendezvous for nearly all vessels entering the Pacific. A day or two after our arrival a party went by rail to Santiago, where they had the pleasure of rejoining Professor and Mrs. Agassiz, and learning of their experiences and discoveries on their overland journey from Talcahuano. The portion of Chile included between the Andes and the coast range is a narrow valley several hundred miles in length. It is crossed at intervals by rudely stratified terraces of shingle and sand running from the mountains on the east over the bed of the valley. The Professor

FOUND GLACIAL MARKINGS

beyond the latitude of Santiago, not so intense, of course, as those observed in higher latitudes, but showing just as unmistakably the northward passage of a sheet of ice, while the lines of shingle running up to the Andes, and called by the natives "*cerritos*," were well marked moraines, derived from local glaciers, which must formerly have descended from the mountains. Previous observers have attributed them to the action of mountain torrents delivering their detritus at first high up, and then lower and lower down, as the land rose slowly from the sea; but in addition to the usual marks of glacial action it was found that in not a single instance did they extend completely across the main valley, as they would probably have done had they been formed by torrents. Many additional facts bearing upon the question were observed, and a report from the Professor himself may be expected shortly.

The general opinion of Santiago was that it represented in many respects the highest civilization we have yet seen, and that its situation on a broad fertile plain at the base of the Andes, with an elevation of about eighteen hundred feet, was almost unequalled for the salubrity of its climate and the grandeur of its scenery. It seemed somewhat strange, therefore, to learn from perfectly reliable and intelligent residents that its

MORTALITY HAS BEEN GREATER FOR SOME YEARS

than that of the great majority of the large cities of the world, but a subsequent experience of some of the party seemed to offer at least a partial explanation of this fact. A visit which was paid to a graveyard situated in the suburbs not very far from the centre of the city disclosed a state of affairs which evinced a disregard for the principles of common decency and humanity astounding in a city somewhat renowned for its culture and refinement. The cemetery is divided into three portions, one with stone walls, marble tablets, neat footpaths and handsome cypresses, which is used by the wealthier portion of the community; a second, plainer, but still respectable in appearance, where the poor are allowed to buy a decent resting place for their deceased friends or relatives, but only for a time proportionate to their means—that is, the graves there are kept to rent for a certain time, after which the bodies are removed and thrown indiscriminately into pits in the third and lowest division, without any mark of identification, and are often allowed to remain exposed without a covering of earth.

A HORRIBLE, GHASTLY SIGHT.

Even in the second division the graves are made so shallow that in many places portions of the bodies or skeletons projected above the surface. As it is all consecrated ground it is not permitted to defile it by the burial of heretics within its limits. It is not a pleasant subject to dwell upon, but it is worth mentioning as a possible cause of the great mortality and as showing the lack of some of the higher elements entering into our own civilization.

Several excursions were taken during our stay at Valparaiso to the adjoining localities, and were very pleasant experiences. Among them was a visit to Viña del Mar, a little village distant some fifteen minutes' ride by rail, but further and more agreeable on horseback. The road leads out through the suburbs, where the houses grow smaller but cover more ground, their low doorways surrounded by swarthy groups washing, weaving or gossiping; the men gay in many-colored *ponchos;* the women usually in clean gowns, their chief beauty being the thick, black hair which reaches in neat plaits far below their waists. Then by spacious, well-ordered slaughter houses belonging to the city—a marked contrast in their cleanliness to the graveyard of its neighbor—past little hovels, the number of whose occupants seemed to be in an inverse ratio to the size of their habitations, and then on a broad, winding path up and down hillsides and over their summits, with magnificent views of the bay, crowded with shipping, and in the distance the snowy peaks of the Cordillera, the highest points in the world outside of the Himalayas. It was often hard to believe that they were a hundred miles away, so sharply did

THEIR JAGGED, BARREN SUMMITS

stand out against the clear sky. It was as strange as if, standing on the Battery and looking towards the southwest we could see a mountain apparently to be reached in the lazy stroll of a summer afternoon and yet knew that it was at Philadelphia.

On another occasion a short trip was taken by rail to the town of Quillota, about twelve or thirteen leagues distant. The road at first runs by the seashore, and then passes through a rather barren district, but soon enters a valley remarkable for its beauty and fertility. Rows of noble Lombardy poplars with bushwood between them serve as fences on either side of the track for miles, and beyond them immense orchards, grassy meadows, groves of fruit and forest trees and grazing cattle gave evidence of the agricultural prosperity of the region. The number and length of the bridges on the road seem ridiculous at this time of the year, when compared with the apparant insignificance of the streams which they cross; but in the wet season the dry, shallow, pebbly water courses which we observed become swollen and turbid rivers and sweep over the plains with great fury.

THE HOUSES AT QUILLOTA

are built almost entirely of adobe or sun-dried brick, and are of only one story, of the usual quadrangular form, with the enclosed courtyard, and generally with extensive grounds attached. The town is spread in this way over an immense area, and thus loses some of the advantages it might otherwise have as a commercial centre of the beautiful province in which it stands, for it has made it impossible to transact business with any despatch. A number of the wealthy citizens of Santiago and Valparaiso have their summer residences there, and we were shown through the grounds attached, and one of them rivalling in extent the country place of Senhor Lagé at Juiz de Fora, which we visited when in Brazil.

We were delayed a short time at Valparaiso by the non-arrival of some cases of valuable specimens; but about noon on the 13th we got under way and ran out of the harbor.

DREDGING AGAIN.

We stopped after going a short distance and dredged, chiefly for the benefit of some of the officers of the Chilean corvette Chacabuca, who had just returned from a survey of the Chonos Archipelago, and were anxious to learn our mode of working. We then continued on our course, and at three o'clock "took our departure" from Valparaiso Light, heading toward the northwest. We ran along for the next two days near the coast, getting occasional glimpses of the Cordillera, and early on the morning of the 16th anchored in the harbor of Caldera, where the usual collecting and exploring party went ashore.

The town is the seaport of the mining district of Copiapo, and as the value of its annual exportations of copper, silver and gold has been estimated at more than ten millions of dollars it has an importance which would never be inferred from its appearance. It consists of two rows of unsightly frame houses stretching along the edge of a desert of sand, not a tree or a blade of grass or a spring of water or anything cool, moist, fresh or green being visible. Wandering through the streets we met

A TAME GUANACO,

who seemed like an old friend, after our experience in the Straits, but did not behave like one, as he repulsed our efforts to caress him by ejecting his saliva toward us in a disagreeable human manner, and then commenced to renew his supply by churning violently with his cheeks and jaws. We deemed it prudent under the circumstances to retire and leave him in undisturbed possession of the field.

The sand overlies in some places beds of imperfectly stratified fossiliferous limestone, while at others there is an outcrop of volcanic rocks, chiefly basaltic and evidently *in situ*, with an occasional "enatic" of granite or perphyry. Many of these were polished smooth, and even by the continual drifting of the sand against them, and this was so marked that the direction of the prevailing winds might have been deduced from comparison of their faces. Others were hollowed out on the side turned seaward, as if by the dash of the waves, though they are now some distance above the sea level. Some tufts of a species of broom, and a number of land shells (*Bulimus*) were found scattered over the plain immediately back of the town, and as far as the eye could reach it was the same blank and desolate, lifeless waste.

All the water used by the inhabitants is distilled from sea water and sold for two cents a gallon. The railroad from Caldera to the town of Copiapo, a distance of twelve leagues, has been of great benefit in the development of the mineral resources of the province. A special train was placed at Professor Agassiz's disposal, to enable him to visit the interior, but various circumstances rendered it impossible for him to do so, and we proceeded on our course the same afternoon, after a slight detention caused by the non-arrival of two of the party, who had crossed to the opposite side of the little peninsula on which Caldera is built.

Then for five days we went on, out of sight of land, with sunny skies and smooth seas, and an occasional wandering gull or a school of clumsy porpoises for company. We sailed by the shores of Bolivia and the great desert of Atacama, re-entered the tropics after an absence of three months, passed close to the Chincha Islands, famous for their immense guano deposits, and on the evening of the 21st dropped anchor in Paraca Bay, a little harbor lying between the peninsula of Paracas and the mainland. The following morning we paid our first visit to

THE "EMPIRE OF THE INCAS."

One party went ashore with seines, guns, botanical boxes, geological hammers, and all the paraphernalia of collectors, while another proceeded with Captain Johnson in the gig to Pisco, a small town on the coast about eight miles from our anchorage.

The heavy surf which beats on the beach and the swell immediately outside prevent vessels from coming very near the shore at that place, and a long pier of wood and iron has been built out into the sea for more than half a mile. The town itself was utterly uninteresting, the houses rudely and coarsely built, and the streets narrow and dirty. The inhabitants derive a large portion of their subsistence from the sale of native liquors, called "Pisco" and "Italia," and the streets were filled at some places with tall earthen jars labelled with one of those names. They also export great quantities of raw cotton.

After gathering specimens on the beach for a short time we hired horses and rode to a fishing station not far off, in order to make arrangements for securing part of the next day's haul. The settlement consisted of about one hundred huts, made by binding twigs or canes to cross-pieces running between the corner posts, raftered sometimes with the bones of whales and roofed with skins, or often not covered at all, for this region is practically rainless, and there have been exceedingly few storms within the period of which we have any historical record—extending over some hundreds of years. The population, and especially the juvenile portion, seemed far in excess of the accommodations, by virtue of that law of increase giving the largest family to the man least able to support one.

THE NUMBER OF BABIES AND VERY YOUNG CHILDREN

of all sizes and shades of color was only equalled by the variety of curs, who playfully disported themselves around our horses' heels, and as the one ranged from those quite white, with an ancestry more Spanish than Indian to full-blooded Africans, so there was every imaginable grade of the other—from delicate greyhound-like animals down to mongrels of the lowest description. The women were sewing or washing linen in front of the huts, while almost invariably above them on the eaves sat two or three gorged, sleepy, aldermanic-looking buzzards. The children were playing indifferently with each other or the dogs, one poor little fellow resting a head so distended from hydrocephalus that it dwarfed all the rest of his body on the back of a patient terrier. The few men who were on shore were stretched out lazily in the sun, waiting the return of their companions from the fishing grounds. We could just see their white sails far out at sea; but they steadily grew larger, until finally several little boats were brought skilfully through the breakers and landed on the beach. Their contents were examined, the necessary arrangements made, and we rode back to the town. Our return to the vessel was effected with some difficulty.

The breeze had freshened and caused a short chopping sea; the bay was covered with "white caps;" the wind came out dead ahead and prevented any profitable use of our sails, and the sun had gone down behind the islands in the West, and the moon risen, fatally eclipsed, before we regained the ship. We found that the day had been extraordinarily productive in every direction, a wonderful variety of specimens having been secured and important geological discoveries having been made.

MORE THAN TWENTY DIFFERENT SPECIES OF FISH

were obtained, more than half of them entirely new. There were eight species of sharks alone, only three having ever been described as belonging to this coast. A seal was shot and skinned; gigantic turtles were captured, and many kinds of birds shot and prepared for mounting. Among the most interesting of the latter was the scissor-bill (*rhyncops nigra*), a species closely allied to one which is a bird of passage in the Northern Hemisphere and is usually found along the coast of New Jersey from early in May until the late autumn months. Their principal peculiarity is in the form of their beak, which, differing from that of a spoon-bill duck, is flattened laterally, is very thin and sharp, and, unlike any other bird, has the lower mandible at least an inch and a half longer than the upper. They fly along the water in immense flocks, with this lower mandible half buried, and dexterously use it to plough up small fish. We saw also great numbers of a species of cormorant called the "shag."

Early in the morning a few would come flying into the bay around the point of the peninsula, coming apparently from some of the islands. They would soon be followed by others, and then for fifteen minutes by a continual stream, sometimes in single file, sometimes in broad, densely-packed columns. They settled on the surface in a very limited area, looking from a distance

LIKE A SMALL ISLAND,

and when for any reason they changed their location the flapping of their wings on the water sounded like the surf on a sea beach. The contrast between their manner of flying and that of the pelicans is very noticeable. The cormorants take short, quick strokes, and keep the wings continually in motion; the others are more slow and dignified in their movements, sailing rather than flying. A pelican which was shot and preserved measured five feet from beak to tail and seven feet between the tips of his wings. Buzzards without number were seen, and also several magnificent condors. The next day—the 23d—was spent in a similar manner, collecting and continuing geological investigations, and about sunset we started for our present station, and the following afternoon rounded San Lorenzo Island and anchored in Callao Bay—said to be the best harbor on the Peruvian coast. It is protected from the swell of the ocean by San Lorenzo, and the climate and prevalent winds from the south render it safe at all seasons. We will probably remain here a few days longer before leaving for the Galapagos Islands and Panama.

THE EDGAR STEWART.

Arrival of the American Fillibustering Steamer at Aspinwall—Her Attempt to Land in Cuba—Meeting by the Cubans on Board—Action of the United States Steamer Wyoming.

KINGSTON, Jamaica, June 9, 1872.

The filibustering steamer Edgar Stewart, which escaped from the United States steamer Wyoming and the Spanish steamer Francisco de Borga on the 14th of May, arrived at Aspinwall on the 21st. After escaping from her pursuers she made an attempt to run into the coast of Cuba, where she landed a boat with four men; but, having been seen by a Spanish gunboat, she again ran away in the direction of Jamaica. She was fired at several times, but her great speed enabled her to escape capture and reach Aspinwall. The boat from the Edgar Stewart reached Port Maria, on the north side of Jamaica, with the four men, who had been for three days without food or water. On the arrival of the Edgar Stewart at Aspinwall the Cubans on board rose against the captain because he insisted upon sailing for an American port, as he had been directed to do by the United States Vice Consul, while they were determined to land in Cuba. The Wyoming, however, hove in sight, and the captain of the Edgar Stewart immediately hoisted the American flag Union down, when a boat was sent from the Wyoming to see what was the matter. The Cubans, on seeing this, made their escape to the shore, and now threa