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FRIDAY, OCTOBER 29, 1875.

All communications for the Society should be addressed to the Secretary
John-street, Adelphi, London, W.C.

PROCEEDINGS OF THE SOCIETY.

INSTITUTIONS.

The following Institutions have been received into union since the last announcement:—

Gartsherrie (by Glasgow), Academy Evening Classes.
London College for Working Women, 5, Fitzroy-street, Fitzroy-square, W.

COMMERCIAL EXAMINATIONS.

The programme of these Examinations for 1876 is now ready, and may be had *gratis*, on application to the Secretary.

EXTINCTION OF FIRE IN SHIPS.

The Pothergill Gold Medal is offered for an effective means of preventing or of extinguishing fire on board ship. Communications, illustrated if need be by models or working drawings, must be sent in to the Society not later than the 31st of December, 1875.

The Council will take into consideration, with a view to reward, the best written paper containing suggestions fitted to secure prevention of fire, or the means to be adopted for the safety of life and property when fire breaks out on board ship.

The Council reserve to themselves the right of withholding the medal or reward offered, if, in the opinion of the Judges, none of the communications sent in are deserving.

MISCELLANEOUS.

THE PORT OF TRIESTE, ANCIENT AND MODERN.

By Captain R. Burton, Her Majesty's Consul at Trieste.

This great emporium of Austrian trade lies in north latitude 45° 38' and east longitude (Greenwich) 13° 46', in the heart of the temperate zone, and almost at the foot of the Julian or South-Eastern Alps.

The Adriatic Gulf, whose longer axis trends from south-east to north-west, forms at its curving head a minor inlet or bay, whose greater length is disposed from south-west to north-east, almost at a right angle to the main line, and this is the Golfo di Trieste (Sinus Tergestinus).

The mouth measures some 16 geographical rectilinear miles from Grado to Cape Salvore, the north-westernmost projection of the Istrian peninsula. Measured from point to point, the circumference in round numbers may be 60 miles (rectilinear geographical). The bight is again divided into sections by the rocky projections of Duino and Miramar. The north-western bay is the Sacca di Duino (Sinus Diomedes), which receives the Timavo River, and the south-eastern represents the Sinus Tergestinus proper. Trieste, therefore, has one great advantage—it is the most inland of the neighbouring ports, even Venice, and it is the natural station for Vienna and the heart of the Austrian Empire.

Immediately about the city, the shore line which, defined by the stony escarpment of the Carso, the limestone platform which supports the Julian Alps, after running in a straight and often in a perpendicular line from west north-west to south south-east, sweeps round suddenly to the south-west, at the north of the new town, where the railway station now stands; and it preserves this direction along the sea front of the harbour as far as the projection called Sant'Andrea. After that the shore line, now eccentric, not nummuletic, resumes its former curve, and once more trending west north-west, to south south-east, defines the eastern bank of Muggia Bay, a splendid natural harbour, which has by no means risen to the development which it deserves.

The chord forming the Trieste Roads is about 1,700 direct yards from the Fanale (lighthouse) to the opposite or north-eastern shore, and its depth to the arc would be about direct 900 yards, giving an area of 1,530,000 square yards. Formerly, more recessed than now, and successively deep water, marsh, salinas, cultivated lands, houses, and New Town, it received three torrents, or fiumaras, locally called Burrioni, which, even within the last century, formed swampy embouchures. To the north was the Martesin or Mortesin, running between the Rojano and Scorcola suburbs, and now discharging north of the new mole, No. 1; the next, defined by the heights of Longera and Guardiella, fell into No. 3, which ran between the bulges of Chiadino and Rozzol (Rozzolo). The latter is the Rozzol Potok, which has now become the Torrente Klutsch. The courses within the city and the mouths are now built over; the only debouchures left are the Martesin and the Klutsch, a Cloaca Maxima which annually carries into the port about 1,000,000 cubic feet of fecal matter, rendering the north of the new town, and especially the fine villas built upon the Scorcola buttress of the Carso encampment, comparatively unwholesome.

The current of the Adriatic begins to be felt about the Ionian Islands, thence it subtends the Dalmatian and Istrian coasts, passes the Muggia, or Back Bay, flows round the lighthouse point, still passing northwards, and stretches down the east coast of Italy to lose itself in the gulf of Taranto. But the tides, which sometimes rise to nearly four feet, take the inverse direction in the Trieste harbour, and the ebb runs from north to south. The discharge of the Isonzo and the Timavo rivers is supposed to explain the Trieste backwater, which is greatly increased by westerly winds causing currents; others again attribute the inverse or north-south flow to the Stegaizza (in German the Wider-See), as the vortex is called all down the coast from the Slav Sték. The Roads of Trieste have two main defects.

1. They are liable to silting up from the washings of the inverse current or backwater meeting the discharge of the little torrents and the city drains.

2. They are directly open from south-west to north-west, and under an obtuse angle to the winds raging between north and east. Yet MacCulloch justly declared the Trieste Roads to be among the best in Europe.

An eminent antiquary, the late Domenico Cavaliere de' Rossetti, writing in the periodical, *L'Istria* (Nos. 14 and 15, April, 1850), divides as follows the history of the Trieste Port into four epochs, which we may now increase to five.

1. Roman: beginning from the date of Trieste being made a Municipium (A.U.C. 576=B.C. 177), and a Colonia under Julius Cæsar (A.U.C. 695=B.C. 58), and ending with the fall of the Western Empire, A.D. 475. This first period thus represents about 6½ centuries.

2. Italic: whose limits are A.D. 475—1382; some 900 years, during which the destruction of Pola and Aquileja (A.D. 452), the chief Roman centres, caused the rise of the Venetian Republic (A.D. 697).

3. Austrian: from A.D. 1382 to 1717, when Trieste, which spontaneously submitted to the Empire, was made a free port by the Emperor Charles VI., a comparatively short period of 435 years.

4. Commercial: the period extending to 1860; and

5. Innovation and injury, lasting from 1860 to the present day.

Concerning these several epochs I will offer a few observations.

I.—ROMAN PERIOD (B.C. 177—A.D. 475).

Trieste being the central point between Venetia, Istria, Illyria, and Pannonia, it naturally attracted the attention of the conquerors, whose engineering, be it noted, far surpassed, in conception and in execution, anything attempted since their day. They found the Sinus Tergestinus proper a baylet with two lobes. The northern half, from the beginning of the sweep to the centre of the modern town, was the arc of a circle; the southern formed part of an ellipse, and here they rightly determined to build their outer port. An islet (perhaps two) with a nucleus of sandstone, rare on this limestone coast, lay distant about one mile from their city, it measured nearly 100 fathoms in circumference and 35 in diameter. This they connected by a reef or natural dyke with that part of the shore which is still known as the Camarzo (Campo Marzio), and here they raised their western mole, 120 fathoms (720 feet) long, in two lengths of 40 and 60 fathoms, wisely leaving an opening of 20, so as to assist rather than oppose the natural current by which the harbour was kept from silting up. This islet, afterwards termed the Zucco, fronted by water 50 feet deep, was provided by them with a pharos on an octagonal base. The double mole, bending north-west by north to north, was composed of fine cut blocks 6 to 8 feet square, which were visible till 1751. The examples of Aquileja, Ravenna, Ancona, Puzzuoli, Pompeii, and a host of other places, suggest that they formed arched causeways, another highly scientific precaution persistently neglected in later days.* From the modern Riva Grumula, at the foot of the hill called "De' Santi Marteri," from the days of olden history, where the Molo Giuseppino now projects from the Piazza Giuseppe II., they threw out their eastern arm, another arched pier, 180 fathoms (1,080 feet) long, in water 6 fathoms deep, and the included space formed the Porto esterno, or Delle navi; it is now popularly called La Sacchetta. The Romans also laid out, eastward of the markets and the merchants' quarters, the inner port or dock (Darsena,† or Porto Interiore), a basin similar to those which we see everywhere along the Mediterranean shores, from Algeciras to Bayrût. It was, doubtless, immediately at the foot of their walled town, which extended in pear-shape eastward up the hill crowned by the Temple of Neptune. To judge from later days, the form of the dock was a truncated triangle

* This arched mole is apparently Dr. de' Rossetti's theory; the adjoining little Roman ports, Cedas, Santa Croce, and Sestiana, show no sign of it, and contented themselves with a gap which might or might not have been provided with a bridge. The silting currents would have been diverted from the outer port of Trieste by the eastern mole.

† The dictionaries (Italian and Spanish) make Darsena an equivalent of the Greek ἐνδοτέρος λιμῆν, the Latin Portus Interior, and the low Latin Arsena, "la parte più interna del porto, cinta pe lo più da muraglia," a dockyard, a wet dock. The Arabs and Turks have adopted it in the forms El Darsana and the corrupted Attarasanas (Et Tarsánah). Some derive the two latter from Tarsh: Khanah, a commissariat dépôt, an armoury, a barrack.

with the shore for base, and a narrow entrance fronting north-west. The eastern arm was formed by a mole projecting perpendicularly from the shore, afterwards called "Molo della Bandiera;" the western, a similar erection, disposed at an obtuse angle to the coast, converged towards the former. This inner port gradually shrank away from the city walls, but it remained, with various changes, till about the middle of the present century, under the name of Mandracchio, locally pronounced "Mandratsho."* The term was probably introduced by the Neapolitan and Genoese sailors who manned the fleet of Charles VI.; it is still preserved in the name of the short quay which extends from the San Carlo mole to the fish-market (Pescheria).

The Romans, moreover, had a number of subsidiary ports, small parallelograms of masonry, a system still preserved on the coast. The positions, and even the remains, may be traced at Cedas, Grignano (Miramar), Sestiana, and Duino to the north; and southwards in Muggia or Back Bay, at Sant' Andrea, Broglietto, and Servola (Silvula?).

II.—ITALIAN PERIOD (A.D. 475—1382).

The history of this age is one of fluctuations and insecure liberty, ever threatened by Italian wars and barbarian incursions. The two-fold port must, however, have been preserved to a certain extent, despite general neglect. In A.D. 1150, two salaried provveditori and one notary had charge of the quays, harbours, and roads; and subsequent statutes were passed (A.D. 1324, 1333, 1354, 1365), which forbade sand and soil to be cast into the water, or the stones left by the Romans to be removed from the inner mole of the outer port. Probably the Darsena or Inner Port sufficed for general use, and possibly, during this epoch, the little piers, the western and smaller, called Delle Beccherie and the eastern, Delle Porporella, a name applied throughout the Peninsula to old ruined moles, were built. Also about the middle of the Italic period (A.D. 920), the torrent flowing under the eastern walls, where the Via del Torrente still retains the name, was canalised under the name of Portizza (little gate), or Canale del Riborgo, corrupted to Triborgo.†

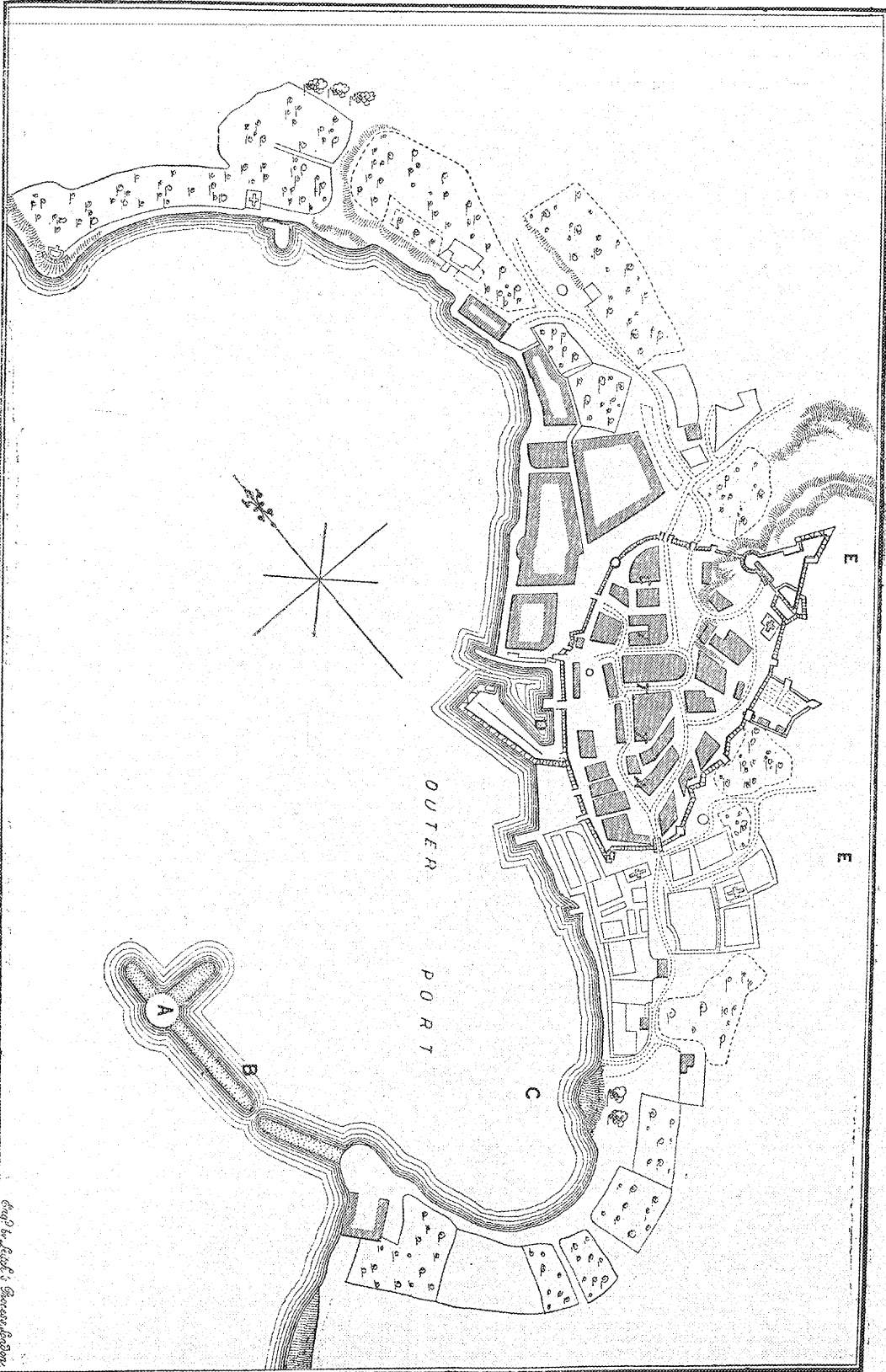
III.—AUSTRIAN PERIOD (A.D. 1382—1717).

According to some authorities, Charles VI., who, influenced by Prince Eugene of Savoy,‡ carried out the plans of Charles V., found Trieste a mere nest of fishermen, like modern Grado. This is not probable. The city of San Giusto had her independent native nobles, her bishop and chapter, her municipal councils of 160 and 40 members, her own armed force, and her establishments for advanced education—theology and philosophy—presided over by Benedictines and Jesuits. The Sacchetta, or outer Roman Port, was probably no longer wanted in the decay of commerce, but we find (A.D. 1554 and subsequently) orders for preserving and cleaning the Darsena, despite which, about A.D. 1604, it was almost silted up. In 1470, Frederick III., after restoring the city walls, raised the Batteria Civica, on the western mole of the Mandracchio, 120 fathoms long, and created magazines on the eastern, where the Government House now stands. In 1620, the castle, then and now called La Fortezza, with its bulwarks, the Rotonda, Venezia or Zudecca, and Barbacane, was built in its present state by Giacomo Vintana, of Gorizia, who fitted the Civic Battery with twenty guns. In 1666, the Captain of Trieste, Count Carlo della Torre Popaita, after escaping a terrible storm, erected on the Zucco islet a chapel (chiesetta) to San Niccolò, pro-

* "Mandracchio" is explained in the dictionaries:—"La parte interna di un porto, oppure seno di mare fatto ad arte." Italian scholars derive it from "mandria," a herd, the small craft crowding in like cattle; Celtic scholars from "man," or "maen," land, field, rock, hill, and "trach," or "troch," a cutting, trench, or canal.

† The word is properly Riborgo, i.e., Rio del Borgo.

‡ Both he and another local benefactor, Giovanni Casimiro Donadoni, are now clean forgotten.



Eng'd by J. G. Smith & Co. Surveyors & Architects

lector of sailors; this was ruined by wind and weather early in the next century.

IV.—COMMERCIAL PERIOD (A.D. 1717—1860).

In June, 1717, Charles VI. signed the instrument creating Trieste a free port; the carrying out of the decree dates from September 10th, 1718, when the Imperial visit took place. On March 15th, 1719, the patent of commerce was given to the Compagnia Orientale trading with the Levant. The Salinas of the Campo Marzio were warped up, and the Lazzaretto of San Carlo (Old Lazzaret) was raised upon the reclaimed ground about A.D. 1731. In June, 1734, Charles VI. began his naval armament of three ships (70, 60, and 40 guns) and three galleys, under Admiral Giovanni Pallavicini, of Genoa, and built two vessels (32 and 30 guns). The present Molo San Carlo, still the chief pier opposite the Communal Theatre, was founded in 1751 by sinking a ship of that name, and by building a stone pier 300 ft. long. In 1788 some 60 ft. were added, and the head was crowned by a battery, which presently disappeared. The Darsena was deepened and dredged in 1721, 1722, 1736, 1741, and 1749. The Riborgo Canal was purged in 1741 and 1749.

We have a valuable map of 1718,* roughly engraved on copper-plate by order of the City, showing her superior claims, as an emporium, to Aquileja, Fiume, Portoré, and San Giovanni di Duino; and it has been illustrated by the periodical *L'Istria* (No. 18, May 4th, 1850). It probably exaggerates the depth of water, and conceals the torrents; it omits seven churches, and it shows only by nameless circles the emissary of the old Roman aqueduct outside the Cavana (south-western) Gate; the Nymphæum, afterwards Fonte di San Niceforo, and now La Zonta (of wine lees); and the Ustia fountain, at the foot of the Istria road. It gives the three great gates—Cavana; Il Porto, the water-gate, where two bronze Moors stood on a tower and struck the time; and Riborgo to the north, with three roads, leading to Lubiana (Laybach), to Staribreg, and to Moncolone (modern Conto-

* References to old plan of the Port of Trieste in the last century See page 981:—

A. The Zucco, now the "Fanale" or Lighthouse, an islet 110 geometric paces in circumference. It was built on sandstone (not the common limestone of the coast), and had a circular shape; now it is pyriform with the stalk to the east, and a bastion of four faces protecting the north-west. The Roman Pharos is said to have been built on an octangular base. About 1666 the chapel of San Niccolò was built on it by Count Carlo della Torre Popafia, Captain of Trieste, after escaping a storm. It was washed away by the sea in 1718.

B. The old mole (Molo del Lazzaretto Vecchio, now di Santa Teresa), with its boccola or passage, by means of which boats were saved from rounding the "Zucco," and the scour of the "Sacchetta" or old port was increased. The Roman mole is said to have been 18 feet above water, and signs of it still remain.

C. Old port or "sacchetta," defended eastward in Roman days by a mole, extending towards the Zucco, and here represented by the Beccheris mole; but cut stones 6 ft. long have been found in water 9 ft. deep.

D. Interior port (Mandracchio or Dock), defended on the west by a battery of 20 guns, repaired in 1820 by Giacomo Vintana, of Gorizia. A chain was thrown across, and in the east (the direction of the "Bora") was the Molo della Bandiera, where Government-house now stands. The Mandracchio communicated with the main square, adorned with the statues of Charles VI. and Leopold; there was also a tower (Torre dell'Orologio), where two bronze Moors struck the hour. East of the Mandracchio lay the "Saline," now the new town of Trieste.

E. The Roman walls of the city were of large cut stones; the defences of the Middle Ages were of smaller material, with pilaster buttresses, and *colti* or passages passing from one to the other. Of the towers only one was round, the rest were squares or pentagons. To the south-east was the "barbacane" or "dongione," a name still preserved by a vicolo or alley. To the extreme east was, and still is, the "castello" or "fortezza," with its Leopold bastion, its Bastione Venezia or Zudecca, and its Rotonda, Venetian work of the fourteenth century. The city had three chief gates:—1. Triborgo, the north-eastern; 2. Cavana, the southern; and, 3. Il Porto, connecting the Mandracchio with the main square. The others, Donata, Portizza, and Pescaria, were of secondary importance.

F. Porto Sporco (foul harbour), probably so-called from the Torrente Martesin (not shown on map), which discharges here. It is bounded north north-west by the Batteria di Musiella, at the mouth of the Burrone (fiumara) di Rojano, where the new lazaretto afterwards was, and where the "Siidbahn" station now is.

vello), with the three secondary gates, Donata, Portizza and Pescaria. It does not show the three then-existent boat-canals which fell into the Salinas, north of the town, where the modern city now stands; these were the Canal Grande, the Canale di Riborgo, or La Portizza and the Canal del Vin, which, crossing the Piazzetta di Riborgo, and the Piazza della Borsa, united with the Portizza. It shows the old Roman walls which were rebuilt with smaller stone in the Italic period, and strengthened with buttresses, united by a passage called the "Volto." It gives one round tower, and a square, neglecting the pentagons (?) built by the Romans. In the Zucco (Santa Teresa) mole, it shows the aperture left for the scour, and useful to boats which then did not require to round the point; it makes the islet circular, and supplies it with two pierlets, on running north, and measuring twenty, the other east thirty fathoms long; these are now incorporated with the islet, as is shown by its pyriform aspect. Finally on the opposite or northern shore, it places the Batteria di Musiella* at the mouth of the Martesin, or Rojano torrent, where the new lazaretto afterwards was, and where the railroad station is now.

The Empress Maria Theresa (A.D. 1740 to 1765), called the "Mother of Trieste," ordered (1749) the demolition of the walls, that the city might spread itself more freely. In 1751, she built the old lazaretto, the lighthouse battery, a four-sided ravelin, with apex to the north-west, and base facing shorewards, and the solid pier (Molo di Santa Teresa), which has done so much harm to the Sacchetta. In 1754, the present Canal Grande (196 fathoms long by 13 broad, holding 16 vessels of 150 to 300 tons) was made or rather deepened up by the engineer Mattia Pirona. The sooner it is filled and converted into a *place* the better. In 1769, the Lazzaretto nuovo, or di Santa Teresa, reserved for severe cases, was erected to the north of the town. Here also, partly sheltered by the Carso escarpment, was opened the Bacino del Lazzaretto nuovo, or di Santa Teresa, concerning which much will be said. It was divided into two parts, and it could contain ten large, or thirty to forty-five small keel. The Canale di Riborgo, or Della Portizza, was filled up by warping, between 1799 to 1818, and the Bourse or Exchange, was built upon it. The old Mandracchio lasted till 1858, and soon afterwards became the Public Gardens, fronting Government-house, and the modern Piazza Grande. In fact, about the end of the last century, the city began to assume its present shape.

From 1768, and especially from 1804, a multitude of plans and projects for the "abonimento" (improvement) of the Roads were submitted to the municipal authorities; happily they remained uncarried out.

Dr. de' Rossetti, premising that "Il non far nulla è meglio che di far male," in 1850 proposed to obviate the two chief evils by these means (Massime Generali per conservare e perfezionare il Porto di Trieste).

1. By an artificial islet formed by sinking ships and building an arched mole or moles of masonry at some distance beyond the chord of the port, so as to act as breakwater and defence against rare gusts and storms from seaward.

2. By reforesting the adjoining hills, and by encasing the torrents with built walls and basins where the water could deposit its mud, instead of silting up the harbour.

An important recommendation which he offered was to restore the Boccola or gap in the Roman mole, so as to promote the scour, and he would have made it compulsory to build all moles, piers, and quays on arches. He saw the future use to be made of Muggia Bay, the true and natural port of Trieste. His words are

* All adjacent places of old had some Musiella, Mugil, Mucil, or Mucia, a word which has not been satisfactorily explained, either as castle, municipality, or colony. At Trieste, it was the name of the northern battery, as the Batteria Civica was the southern. Musiella also had a rubble mole, which, with another farther south, projecting from the Rojano church (San Pietro), formed the "Porto Sporco," or foul port.

(p. 150 "L'Istria," April 13, 1850) "Se le bisogne di ancoraggio e di nuovi stabilimenti portolani lo richiederanno, vi si destini il seno di Muggia, il quale dal Molo del Lazzaretto Vecchio fino alle Saline di Zaule presenta e lido e mare atti ad opera e stazione qualunque. Così potrà Trieste gloriarsi d'aver due porti, nel secondo dei quali potrà senza pericolo e con somma utilità provvedere a tutte quelle occorrenze, per servire alle quali si fecero progetti che, eseguiti non gioverebbero ché alla totale rovina del primo." And he characterised the project of a "port inside a port" as follows:—"Non capisco nemmeno adesso che cosa intendesi di dire quando si parla di costruire un porto per Trieste. Non vi trovo piri senso che nel dire di voler costruire una casa nella casa. Trieste ha il suo porta nella sua Rada interna, sicura per quanto la natura lo comporta, e già come tale, sicura abbastanza quando si tolgano gli abusi e le negligenze (torrents and drains). Chiunque voglia fare delle costruzioni solide entro alla corda dei due Lazzaretti (old and new)* non potrà aspettarsi che la maledizione dei posteri, come se lo merita quel' ingegnere che nell'anno 1751 chiuse la bocca del Molo Romano detto 'Zucco', ora 'Molo di San Teresa.'" I cannot but think him right. My plan would have been simply to open the Lighthouse mole, and to prolong it as a tentative measure by a floating breakwater, which could readily have been removed if found injurious, lengthening at the same time the existent quays and moles, and running a tramway along the town front from the railroad to the Sacchetta.

This Triestine worthy deserves well of his country. His public life was devoted to advocating her interests, and his private hours to studying her history, literature, and antiquities. In 1811, General Joubert offered to make him Podestà (Mayor), but he refused to serve under the French invader. After the defeat of Napoleon I. at Leipzig (1813), and the recovery of Trieste by Austria (1814), a false report was spread that the city of San Giusto was to be treated as a conquest, and to lose her position as a free port. Rossetti, a poet and a writer of distinction, then girded up his loins, described in eloquent prose the noble municipal establishments of the Latin race, recited the privileges of his native city, and continued for the rest of his life to advocate her cause, and to serve her in various civil dignities. He found her a mere "Hof" of 6,424 souls; he left her a flourishing port with 20,000, a total which has grown to sixfold. Born, March 19th, 1774, he died on November 29th, 1842, and the centenary of his birth has lately been worthily celebrated by his fellow citizens. Besenghi degli Ughi, a critic who is by no means mealy-mouthed, said of him, Domenico de' Rossetti, "Aveva avuto il corraggio di durare tanti anni (68 years) a fine di ingentilire od almeno dirozzare quel nudo scoglio di mare col soffio umanissimo della coltura e delle lettere."

IV.—PERIOD OF INNOVATION AND INJURY (1860—1874).

Trieste had now escaped the immediate effects of stubborn Germanisation, and the day of Constitutionalism had made her a free town as well as a free port. Her Emperor entitled himself "Signore di Trieste;" she had her Diet distinct from that of Istria; she returned four members† to the Lower House at the capital, and her "Magnifico Podestà" and municipality took unlimited charge, often with very little wisdom, of all her internal arrangements.

We now come to the days when the public began to clamour for the "bonification" of the Porte. The Suez Canal, believed in by all men except Lord Palmerston, had aroused the Mediterranean world with the hopes of

* The former is now an Imperial Royal naval depot, the latter is to be demolished, the grounds being occupied by the railway. The (last) "New Lazzaretto," a large pile of building, lies at some distance south-west of Trieste, behind Punta Sottile, the left hand (southern) prong of Muggia or Back Bay. Its only harm is tending to keep up useless quarantines when railroad trains are freely admitted.

† The City, 2; Chamber of Commerce, 1; Territory, 1.

sharing in the rich trade of the nearer and the farther East. Algiers, Marseilles, Genoa, Ancona, Leghorn, Naples, and Brindisi, began almost simultaneously to brush up their old-fashioned establishments, and the citizens of Trieste were seized with a desire to convert their open roads into a closed port or a system of docks. They complained that their city had none of the great works extending from Havre to Stettin; that their imports of coal and iron, and their exports of grain, wood, and flour, had greatly increased without proportionate conveniences; and that the waste of money in the daily embarkation and disembarkation of 35,000 zoll. zentners (about 1,740 tons), costing per annum 1,188,000 florins, was not only a *lucrum cessans*, but a *damnum emergens*, for which the consumer had to pay.

After 1854, too, the grain trade had so developed itself that ships, finding no room at Trieste, were driven to Venice, or had to land their cargoes in Muggia (Back Bay) where the Sponda di Servola had recently been bought with the view of establishing a new port. And in 1861, the glut was further increased by the opening of the Pesth-Kanischa-Pragerhof Railway, which added the cereals of Hungary; the two articles, grain and building woods were expected to form five-sixths of the freightage of that line. On the other hand, the roads of Trieste had cost but little; during the thirty-five years preceding 1872, the total expenditure of harbour improvements amounted only to 360,000 florins.

Before giving an account of the various projects proposed, and of the plan finally adopted, let us briefly consider the evils to be remedied. The Roads, I have said, are comparatively open, exposed in winter to northerly, in summer to southerly gales. The former are chiefly the two land winds, *Greco Levante* (east north-east), and the *Patria Bora* (Boreas), a generic term for the Baltic current, which ranges between north north-east and north-east. This mountain blast rushes down like a Pampero upon the heated atmosphere of the seaboard and the sea; it seldom extends from Trieste far down the Gulf, but it shallows the shore water, and it causes a furious "*ressaa*," its average may be 200 days in the year, and its violence during 30 to 33 prevents work in the harbour. Exposed parts of the streets must be roped to prevent men being blown into the sea; near Fiume, a railway train has been upset, and many accidents, even fatal, annually occur. The furious whirls of wind do good by cleaning the streets and scavenging the foul Old Town; at the same time they injure agriculture by rapidly drying up the rain. The enforesting of the mountain plateau (*emboscamento del Carso*) may mitigate the pest, but it has already worked some harm by equalising the temperature in summer, and by thus abolishing the "Embatto" which, rising at 10 a.m., blew till 4 p.m. This sea-breeze was most useful to sailing ships making the roads, and the "Borino," or land-wind of the same season, was equally favourable to those leaving it.

The sea-winds are also two, both the gift of torrid Africa. The "Libeccio," or south-wester is rare; it seldom outlasts the third day, but the long fetch raises the heaviest sea; it has tossed small boats and rafts upon the quays and into the squares. The rainy and misty "Sciocco" (Scirocco) is the complement of the dry and frigid Bora; the wind of spring, summer, and autumn often raging out at sea when the north-eastern blows furiously at Trieste. It lasts violently for twenty days to three weeks per annum, and it is always a depressing and malarious current whose tepid damp, however, brings showers beneficial to the droughty fields. It raises, whilst the Bora depresses the water; it chokes the twenty-one drains, not including the Cloaca Maxima (Klutsch), returning their nuisances to the town, and it seriously interferes with landing and embarking goods. During years when these winds were abnormally violent they have reduced the working days (loading and unloading) to 200, and even to 190, instead of the

normal 215, which does not include the 72 Sundays and festivals. But the evil is greatly exaggerated by the backwardness of the Port-City. There is not a single shed under which to land or house goods during the heavy and persistent rains. Instead of tramways we still find the primitive "zwei-spänniger Karren," long, low drays, often worked by carriage horses, and the cart drawn by a single ox. Turbulent Montevideo has steam-cranes on the moles; apparently, they are not dreamt of at Trieste, except for building the new port.

I was surprised to see the state of the principal harbour and emporium in the empire-kingdom which had resisted improvements for sixteen years. About half the larger sailing vessels frequenting the port are compelled, by want of quay space, to load and unload by lighters; and almost all made fast to the "rive" (quays) instead of being berthed alongside, are ranged stern on, so as to be connected with the shore by a plank. This primitive fashion of taking in and discharging freight is used in modern ports only when extremity compels. Cargo was carried ashore by "facchini" without any trace of labour-saving machinery; and ships were often only too glad of landing their contents in any way they could. For instance, the B. & N. A. S.S. *Morocco* anchored in the roads on the evening of my arrival (Friday, December 6th, 1872). She could not break bulk for two days, room being wanting at the San Carlo Mole, which, moreover, can be used only at low water, there being no berth to land goods at high tides. On Sunday she found a place, and on Monday (December 9th) she began work at about 9 a.m., when the sea ceased to wash over the pier. The operation was delayed by the heavy showers which prevail from November to May; nowhere can a bale of goods be shipped or unshipped in a marketable condition; and even the railway is still fronted, as it has been since 1858, by an open, muddy space, over which perishable commodities must be carried. Briefly, the *Morocco* was unable to leave Trieste before noon on December 17th, having taken ten clear days to discharge and load, instead of two or, at most, three, paying her crew £400 instead of £120. It would have suited her far better to pay at once £100 for proper accommodation than thus to be mulcted for demurrage. The circumstances were exceptionally against her; but during the six months of "Bora-gales" and "Sirocco-storms" at Trieste, matters are often worse than between the 6th and 17th December, 1872. Finally, between that time and May, 1875, there has been no attempt at improvement except a few dynamite mines, sprung to deepen the "sacchetta" or space between the Molo Sartorio and the "fanale" (lighthouse).

The first and the last sensible proposal for benefiting Trieste was made in 1856. Mr. Clark, an English engineer, was authorised by the Imperial Government to apply to the municipality for a concession and a grant of £800,000. The object was to make a tunnel of 826 metres through the macigno or soft sandstone ridge, called San Giacomo, which separates the city from Muggia Bay, and to lay out a regular port with basins and moles, in the noble natural harbour behind or south of the city. But it was objected that the removal of the shipping would injure the owners of houses and magazines in the harbour of Trieste, upon which much capital had been expended. To this difficulty there are two solutions. Firstly, Muggia Bay, a safe port, defended against the winds by the two points, Sant' Andrea and Sottile, and easily fortified by batteries against attacks fatal to the new port at the edge of a large commercial city, would be a general amelioration, and what improves the whole must be held to improve the parts. Secondly, a line or lines of tramways from Muggia Bay, along the shore of Sant' Andrea and the city frontage to the railway station, would, instead of deteriorating, raise the value of property throughout the line of improved transit. The present state of affairs and the future prospect will be still worse when the new port shall be opened to trade;

not only will house property suffer, but the whole city will be condemned to inevitable loss. Such, however, are the short-sighted views of individual profit which prevail. Only lately a few Greek merchants have been able to prevent the filling up of the malarious Canal Grande, because their brigantines could no longer anchor under their windows. I may here note that part of Mr. Clark's scheme is about to be revived. A tramway gallery, eight metres broad, is again proposed between the Piazza Santa Catterina and Muggia Bay below, or north of Servola. The expense, including a small reserve fund, is laid at a maximum of £200,000; and as ground at the city end commands from 25 to 200 florins per square metre and 3 florins in the suburbs, we may expect to see it in the London market.

But Muggia Bay, the true port of Trieste, is being rapidly occupied, not by Government, as it should have been, but by private companies. Beginning from the north we find—

1. The Tecnico Triestino. These iron works have a considerable establishment behind the shore and the Servola road; as yet they have not occupied the water-side.

2. The Austrian Lloyd, whose shell of Maltese stone is said to have cost over half-a-million of florins; the large and expensive building yards and workshops occupy a large sea frontage, and a long thin wall projecting south is all the protection required against weather.

3. The Navale Adriatico (Schiffswerfte S. Marco), formerly called from its founder the Cantiere Tonello, covers perhaps the best place, and is defended by a short thin pier projecting from the centre. This establishment is understood to be insolvent, and more than one offer of purchase from England has been reported.

Beyond the latter the ground is occupied by the gasometers, by an extensive rope manufactory, by the village of Servola, and by the new slaughter-houses; about these abattoirs the country is decidedly malarious, and calls for plantations of the Eucalyptus.

During my first visit to Trieste (1856) I had noted the merits of Muggia Bay, and when taking charge in 1872 of Her Majesty's Consulate, I introduced the subject to His Excellency the Governor, Baron Ceschi, and to the President of the Maritime Government, Chevalier Alber von Glanstätten. Both lent a willing ear to my proposal that a plan for converting Muggia Bay into a port be submitted to engineers and capitalists in England. My proceedings were communicated to Mr. Thomas Page, C.E., whose name is known in connection with the Thames Tunnel and the Westminster-bridge; unfortunately he had other engagements. This project, like the tunnel, is by no means dead; during the last few months there has been much talk about it.

I now proceed to notice with necessary briefness the principal plans and proposals for the "bonification" of the harbour between 1856 and 1863. During the latter year Sir Charles Hartley, C.E., the chief engineer on the works at the Danube Mouth, was invited by the "Hafencommission" to give his official opinion upon the thirteen proposals which had been submitted to it. Of these twelve proposed to improve the harbour and one to build a ship canal. The distinguished English engineer, I believe, was in favour of a long mole run seawards, and perpendicular from the Bacino del Lazaretto nuovo (the Quarantine Basin), now unhappily filled up.

I. The plan of the Fratelli Martin (Dec. 31, 1856) proposed to increase the harbour accommodation by prolonging the existing piers, which are now eleven. Beginning from the south they are:

(1.) *Molo Santa Teresa* (Lighthouse pier), the long jetty extending from the old Lazaretto now a Government depôt, to the lighthouse, and arresting by its solid dam the scour of the Sacchetta (inner or southern harbour). The same depôt has within its walls two more stumps of moles which were built by and used for the oldest of the three quarantine grounds.

(2.) *Molo Barland*, or *Molo del Carbone*, from the Englishman who built it and from its modern use; it is a third mere stump.

(3.) *Molo Bruna*, at the sharp angle where the shore of the Sacchetta, bending from north-west to north-east, joins the harbour proper. This little projection has a single arch, a necessary wanting in all the other piers save the following and No. 9.

(4.) *Molo delle Preve Cotte*, so called from the bricks here landed; it is about 18 paces long.

(5.) *Molo Sartorio*, a longer line off which ships formerly lay when performing short quarantine. It is capped by the Casino of the I. R. Guardie di Finanze (Finanz-Wache), a painted building, capped by an old-fashioned anemometer, where daily observations are recorded at 8 a.m. The Fanale (Pharos) tower also shows the state of the thermometer and barometer upon a large ladder-like scale, with a moveable wooden slat; both instruments are as usual Centigrade; and it would be advisable that our ship instruments should be provided with this system, as well as with Fahrenheit and English inches. Observations for weather are also taken on the roof (cupola) of the I. R. Academy of Commerce and Navigation; but the arrangements are not liberal enough; for instance, there is an utter want of seismological instruments in a city where earthquakes are frequent, if not severe.

(6.) *Molo del Vin*, for landing wine.

(7.) *Molo Giuseppino*, opposite the Piazza of the same name, where, on April 3, 1875, the statue of the late Emperor Maximilian was unveiled by H.I.R. Majesty. This is a thin line of masonry where wine boats unload to the south, and on the other side the Austrian Lloyds and sometimes foreign ships lie.

(8.) *Molo della Sanità*, the shortest of the moles, fronting the quarters of the Maritime Government, pilot's office (corpo dei Piloti e della Sanità), and wholly occupied by the Casino della Sanità (health officer), which has lately been enlarged.

(9.) *Molo S. Carlo*, the principal landing pier before mentioned; it has a single arch at the root and it wanted only enlarging.

(10.) *Molo del Sale*, another short or half pier; it will be overlapped by the new mole W. IV.

(11.) *Molo Klutsch*, a long thin line at the northernmost bend of the bight, where the new works begin. Here the very offensive main drain (Klutsch) discharges through three arches to the north or almost under the railway sheds. The Klutsch was built partly by Government and partly by the Südbahn. All these piers are well and solidly made of the grès or sandstone of the adjoining hills. It is a material which requires careful selection, and the present state of the masonry built in the days of Maria Theresa shows how well it can resist sun, rain, and water. For pavements it is not slippery like limestone; but when not well chosen, and especially when the joints are wide and not close as they should be, the surface scales and wears into holes. All the old piers were built with caissons and *béton*, except the long narrow Molo Klutsch, which was laid on slabs; they required only lengthening, broadening, and providing with arches near the heads, so as not to arrest the scour. The "rive" or quays also called loudly for widening.

II. The next important plan for "bonification" was proposed by Cav. S. C. Rosenkart, in an "Antrag," a pamphlet printed by the Austrian Lloyd's Office, May 27, 1861. The same merchant also published "Denkschrift zu dem am 13 April, 1867, zwischen den hohen Ministerien der Finanzen und des Handels einerseits und der K. K. Südbahn-Gesellschaft andererseits, bezüglich des Hafenaues in Triest abgeschlossenen ueber Einkommen," von S. C. Rosenkart Wien, 1867. His plan was to preserve and deepen the Bacino del Lazzaretto nuovo, the quarantine basin, a measure very popular with the citizens, and to defend it by a mole 700 feet long, projecting from the Santa Teresa Battery, on the road to Barcola (San Bortolò). The objections were

that this project would add berthage sufficient only for six large vessels, not for 18 as the author supposed; moreover, that instead of approaching the town these works would go further from it, where the waters are more exposed to the south-west (Libeccio) and the south south-west (Ostro-Libeccio) winds.

III. Major von Schröder proposed two straight "dighe" or projecting moles, one from the Molo Santa Teresa, or lighthouse pierhead, to run almost north, and the other trending to the south south-west from the western side of the Bacino del Lazzaretto nuovo; both converged to a mouth 1,150 feet broad. This was objected to because it would cut the valuable roadstead in two, encroach upon the centre of the port, and unload ships in the roughest water.

IV. The plan of Cav. J. Mauser proposed as a principal feature to cut a canal through the point S. Andrea, so as to communicate with Muggia Bay. It was to be 180 feet wide, sufficient, in fact, for three ships abreast; it was to connect the Sacchetta with Muggia Bay, about Strudthoffs establishment, and it was to be crossed by two large bridges. In fact it was a trimming between part of M. Talabot's and Mr. Rieter's systems.

V. Captain Drago Poppovich published (June 14, 1862) a lithographed "Memoria" and a "Piano del Nuovo Porto di Trieste," which accompanies this paper.* With the concurrence of many merchants and amateurs, he proposed to modify the "Talabot" harbour, which he contended would be most injurious. The principal changes are in the breakwater and in the part about the railway station. The former was converted into a dyke 3,050 feet long, beginning with a clear passage 600 feet broad, between it and the fanale or lighthouse; running to the north by north-east, and leaving another clear passage 350 feet wide fronting the new Molo del Lazzaretto nuovo. This breakwater, thrown out 2,050 feet beyond the "Talabot" dyke, necessarily enclosed more room. The new mole was to project 1,950 feet to the south south west, towards the breakwater, thus protecting the Lazzaretto basin, which was to be deepened and to be supplied with an outer dock 1,950 feet long (north north-east to south south-west) by 1,450 broad (east to west). The railway Darsena, or basin north of the Torrente Klutsch, was to be filled up a by a triangle with a base of 2,000 feet. Quays and wharves were to front the city; the existing moles were to be retained, but the four (Nos. 5, 8, 9 and 10) were to be enlarged to a length of 900 by a breadth of 150 feet. The Molo Klutsch, the northernmost, was included in the made ground, and the Molo Santa Teresa, the southernmost, was to be opened by a wide scouring passage for the benefit of the Sacchetta. To this plan it was objected that the dangers of the Bora (north-easter) would be increased, that all but the well-sheltered Sacchetta would be more exposed to the fury of the Libeccio (south-wester), and that a large portion of the basins fronting the town would be taken to make wharves.

VI.—The last of these twelve projects which requires notice proposed to build the new docks upon the Algiers-Marseilles model, north of the Lazzaretto basin, and half an hour distant from the city. This was simply to take the town out of town.

The Porto-Canale was a gigantic scheme worked out by MM. Rieter and Buzzi, the former a merchant, the latter a civil engineer; and it seems to have been the after-growth of the Suez Canal. It was described in two works "Verbindungs-Kanal der beiden Buchten Triest und Muggia," Trieste 1862, and "Dilucidazioni sul Porto-Canale Rieter," by L. Dott. Buzzi, Trieste Coen 1863. The minute sections and plans published to illustrate this undertaking were highly praised by Sir Charles Hartley. This mighty salt-water sea-arm was to set out from the southern end of the Canal Grande; to cross the Piazza della Barriera Vecchia, about 60 ft. above sea-level; to

* This will appear with the plans of the "Talabot" scheme in the next number of the *Journal*.

cut through the ridge of San Giacomo, 174 ft. high; and to issue near Servola Point, after a total length of about a sea mile and a half. The breadth was to be 180 ft., the depth of water 31 ft., containing some 216,842 cubic fathoms, and the sole to be sunk 37 ft. below sea-level. It was to be crossed by two "monumental" standing bridges, one 174 ft. high, and the other 67 ft.—evidently too low for safe transit—together with five swinging bridges, on the "Irving" principle. Fifteen transverse tunnels, sunk 28 ft. below the canal, or a total of 65 ft. (28+37) below sea-level, would enable the water and gas pipes to pass under it between city and suburb; and it would be aided by a tramway or tramways connecting the Rive Grumula and Servola, *vis-à-vis* Sant' Andrea.

This grandiose undertaking—whose expense was modestly fixed at 17,000,000 florins—looked forward to the day when the city shall contain 300,000 souls. It offered the advantages of a quay 84 ft. wide and 18,000 ft. long, and containing a water area of 38 acres (1,162,000 square feet), passing through the centre of the town. At the Muggia end, it would bring into use 30,000 "klafter" or fathoms (120,000 metres) of building ground, which might be expected to yield 3,000,000 of florins. This, I may note, was the object of Mr. Clark's tunnel, and of the present plan before alluded to.

On the other hand, malcontents declared that no borings had been made on the San Giacomo ridge to ascertain the proportions of clay and sandstone and the possible existence of harder rock; that the swinging bridges would cause delay, and the tugs would injure the banks; that the removal of 4,774,000 cubic metres above, and 1,187,000 below, sea-level—estimated to require 10,000 to 15,000 workmen for five years—must at least be doubled; that the expropriation of 250 houses, lodging 5,000 souls, and 80 acres of ground, inadequately laid down at 7,281,000 florins, would soon exceed 20,000,000 florins; and, finally, that the 17,000,000 florins of the estimate must be extended to 45,000,000 florins, thus greatly exceeding the Talabot project. In fact, the public voice declared the scheme to be commercially impracticable.

(To be continued.)

THE RESOURCES AND CONDITION OF ROUMANIA.

The kingdom of Roumania was formed by the union of the two principalities of Wallachia and Moldavia under a firman granted by the Sultan, June 12th, 1861, and was publicly promulgated at Bucharest and Jassy before the end of that year, the name of Roumania being given to the united provinces. Wallachia is divided into eighteen, and Moldavia into thirteen districts, each of which has a prefect or governor, a receiver-general of taxes, &c. The chief cities are Bucharest in Wallachia, and Jassy in Moldavia, but the former city has become the recognised capital of the Roumanian kingdom.

Considerable ignorance prevails as to the countries bordering on the Lower Danube. The Moldo-Wallachians, the Servians, and the Bulgarians are strangely jumbled together in the minds of the general British public; yet there exists as marked a difference between a Roumanian (Moldo-Wallachian) and a Servian, or Bulgarian, as between an Englishman and a Frenchman, or German. There is greater dissimilitude between the towns on the left bank of the river—Galatz, Ismail, Giurgevo, or Turnu-Severin—and those on the right bank—Silistria, Rustschuk, Nicopolis, or Widin—whether considered as to outward form of the buildings, or the character, language, and costume of the inhabitants, than between almost any neighbouring towns that could be mentioned. Ignorance seems to extend even to the geographical position of Bucharest. Consul-General Green mentions the circumstance of a writ of summons, issued by one of the inferior law courts of the British metropolis, directed to Bucharest "in the

kingdom of Egypt"; and it is therefore not surprising that letters addressed to the Roumanian capital should sometimes travel to India in search of Bokhara. Of late years we are informed that Bucharest has made great progress as a centre of the commercial and banking transactions of the principalities. The loans contracted abroad and the government and municipal securities in circulation have been of great advantage to the capital in a business point of view. The habit of hoarding has been checked, and the local newspapers now find it necessary to quote regularly the value of the various securities which are extensively held in the country. An exchange has been established by the principal bankers and merchants to facilitate their operations. The "Bank of Roumania" was founded by English and French capitalists, in 1865, with a capital of one million sterling. The "Société Financière de Roumaine" is of recent formation, and besides there are a number of private bankers.

The finances of Roumania are generally considered to be in a satisfactory condition, inasmuch as the higher rates of interest paid upon the earlier loans have been reduced upon subsequent borrowings. A considerable portion of the revenue is absorbed by the army. This force is divided into four classes, namely the permanent army, with its reserves; the territorial army and its reserves; the militia; and the national guard in the towns, with the masses in the rural districts. The reigning Prince is the Commander-in-Chief; the Minister of War has the general administration. The permanent army consists of eight regiments of infantry, four battalions of riflemen, one battalion of pompiers of Jassy, two companies of foot gendarmes, and one company of discipline. The cavalry includes two regiments of hussars, one squadron of instruction, and five squadrons of horse gendarmes. The artillery consists of two regiments of seven batteries, one company of pontoniers, one company of armourers, and one section of transport service. The staff corps is formed of one battalion of four companies of engineers. The flotilla of two companies, and the administrative corps of one company of workmen, one company of hospital attendants, and one squadron of transport corps. The territorial army consists of eight regiments of infantry, called "Dorobanze," eight regiments of cavalry, called "Calarashi," and one battery of artillery for each of the thirty-three districts into which the principalities are divided. The conscription for the standing army and the territorial army takes place simultaneously, the smaller numbers drawn being taken for the permanent army; but those who are willing to find their own horses pass into the "calarashi," whatever number they may have drawn. The territorial is subject to be mobilised and concentrated for manœuvres or other service. The militia is composed of two classes. The first-class consists of all those from twenty-one to twenty-nine years of age who have not been drawn for the permanent or territorial armies; the second-class consists of all those from twenty-nine to thirty-seven years of age who have served in either the permanent or territorial armies. They are exercised every Sunday in their own districts, and if called out for more than forty-eight hours are paid and fed on the same footing as the army, and are subject to the same discipline. The masses and national guard include all men of thirty-seven to forty-six years of age, are organised, and may be called out for garrison service in time of war, or to maintain order in time of peace when the troops are concentrated for manœuvres.

The first railway opened in Wallachia was that between Bucharest and Giurgevo, connecting the capital with the Danube. Its length is 42 English miles, with a single line of rails. It was opened on the 31st October, 1869, and is worked by the State. It has been extended about three miles down the river, to a point called Smurda, where vessels lie when the waters are too low for them to reach Giurgevo. The next Roumanian line

MISCELLANEOUS.

THE PORT OF TRIESTE, ANCIENT AND MODERN.

By Captain R. Burton, Her Majesty's Consul at Trieste.

(Continued from page 986.)

I now approach the plan which is actually being carried out. It may be called a dependency of the Südbahn, the "Great Southern," connecting Trieste with Vienna. This line was begun by the Austrian Government, under the late Baron de Bruck, Minister of Finance. Circumstances compelled the Empire, on April 23, 1858, to sell it shortly after it was opened (June, 1857), to a mixed private company, French and Austrian. The General Direction was and still is at Paris; the Vienna Branch Board of Administration consists of eight members, the most conspicuous of whom is the Rothschild house, by far the most powerful subjects of the Austrian Crown, and the president was the late Baron A. S. de Rothschild.

It is not within the scope of this paper to show the injury done to Trieste, and, through her, to all Istria, by this powerful monopoly of transit between chief port and capital. Suffice it to say that it is an *imperium in imperio*, a financial despotism in a constitutional land. For instance, on April 13, 1867, the Südbahn renounced its right of being the only line of communication until December 31, 1873; after which it would enjoy the monopoly for 99 years. At the end of that period (1867), the proposed rival lines of Trieste-Laak and Trieste-Predil had contended against each other till neither could obtain a concession, and the company might have insisted upon claiming its century of career without concurrence, but an arrangement was entered into deferring the evil day for a few years. Those familiar with local politics cannot fail to see how the affair will end.

The first steps towards providing Trieste with the new harbour, which is still being constructed, began in 1861, under the Stadthalter (Governor) Baron von Burger. The Südbahn had, I have said, become the property of a company: it proposed to extend its operations, and supported by His Excellency Count F. Zichy, and the Vice-President of the Central Maritime Government, Chevalier (afterwards Baron) von Becke, Minister of Finance for Austro-Hungary, M. Talabot, a French engineer distinguished by the Marseilles harbour-works, deputed by the Südbahn, presented his project, in June of that year, to the Crown. His original plan is now become a matter of archeology. It proposed one long quay formed into a basin by two moles; the northern projecting from the Lazzaret-basin (Bacino del Lazzaretto nuovo), which was to be filled up, and the other from the Molo Klutsch (No. 11). A vast breakwater, beginning parallel with the former, and sweeping with a curve opposite the latter, was to be carried on till fronting the Molo San Carlo (No. 9), which was also to be enlarged. Lastly, another, but a short, thin breakwater was to project north-westwards or seawards from the Molo Santa Teresa, which was to be opened for a ship passage, whilst a similar dam would pass round the point of Sant' Andrea, and form another port (Sant' Andrea) between the point and the establishment of the Austrian Lloyds.

On December 12th, 1861, the podestà (mayor), and the President of the Chamber of Commerce, alarmed by the amount of change proposed, memorialised the Ministry against the first Talabot project. But the Austro-French War, which ended with the Treaty of Villafranca, had left the Empire in a state of financial and commercial depression when capitalists were practically invincible. Moreover, the action of constitutionalism, in countries not accustomed to it, is a Liberal

measure which adds almost despotic powers to the authorities at head-quarters. Prince Metternich would have consulted the wishes of the Triestine public; Baron de Bruck and his successors did not. As late as December 12th, 1872, the City Council of Trieste has memorialised the Ministers of Commerce and the Chamber of Deputies at Vienna to arrest the works, because they are injuring the port, but the effect has been absolutely nil.

The city was soothed by the kindest of promises, but on April 22nd, 1862, a Commission was appointed to sit upon the French project at Trieste, under the same governor, M. Talabot himself being present. The pamphlet, "Das Triester Hafen Project" (Wien-Manz, 1862), contains the names of the Commissioners, and provides a plan of the works which is shown in the map of Captain Poppovich. After sending for M. Pascal, the chief engineer of the Marseilles harbour, and obtaining his approval, the Commission, amongst whom were four representatives of the powerful Südbahn, adopted by a large majority, 123 to 3, the second Talabot project. At the same time they rejected the three rival plans and modifications put forth by Major von Schröder, Captain Poppovich, and H. von Conti.

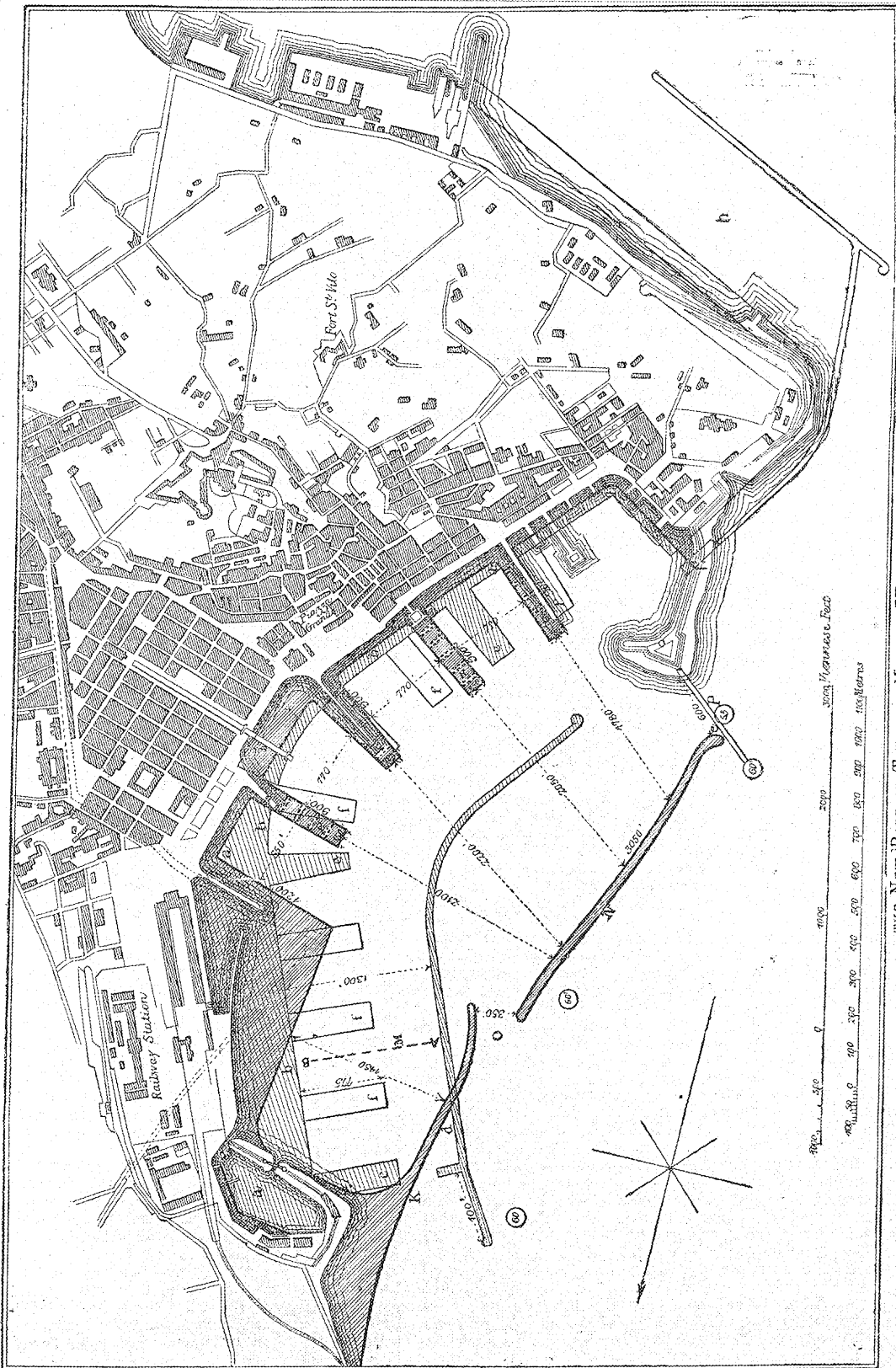
On April 22, 1862, the Talabot harbour was submitted to the Crown. It proposed two forms to be divided into two periods of execution.

1. The original or imperfect form consisted of a masonry breakwater (Schutzdamm or Diga), 6,500 feet long, bending from north to south-west, averaging 1,300 to 1,500 feet from the shore, and provided with a double entrance, the northern 300, and the southern 700 feet wide. The whole water-line, from the lazzaretto to the lighthouse, 2,721 fathoms, or 163,260 feet long, to be converted into a quay of solid masonry, pushed out to a maximum of 600 feet. Four monster moles, 700 to 775 feet in length by 240 to 285 feet broad, to form as many basins; the area of the latter to be 159·13 Austrian Joch (4,139 square fathoms) accommodating in toto 2,500,000 to 3,000,000 tons of shipping. The most unpopular part was filling up the secure Bacino del Lazzaretto Nuovo, *alias* the Porto Santa Teresa, and the Bacino della Darsena, or railway basin lying to the south-east of the former. The estimates for the first step were fixed at 18,000,000 florins.

2. The perfected form added 6 moles, making a total of 10; the length of the quays and piers would be thus increased from 2,721 fathoms to 4,139 (248,340 feet), and the area of the seven new basins would be reduced from 159·13 to 140·57 Austrian Joch (3,656 square fathoms.) In the new port of Marseilles (1861) these figures would be 4,000 metres (2,109 fathoms) of quay, and 52 hectares (87 joch) of basin. The projected form gave accommodation to 5,000,000 or 6,000,000 tons of shipping: here we see the extravagance of space proposed for Trieste, whose entering tonnage in 1861 was only 750,000. But, as it reduced the height of the breakwater from 40 to 8 feet, the sum of 16,000,000 florins was deemed sufficient.

A glance at the plan (in Poppovich) shows that it proposed fundamentally to alter the whole disposition of the roads, in fact, to force a port upon nature, without the least regard for her own arrangements in the matter of winds and currents. I need hardly notice the imminent danger of such operations, a remark applicable to all hydrographical "improvements," unless tentative measures, perhaps prolonged for a term of years, are employed with all prudence. Hasty works, it need hardly be said, are likely to convert disadvantages into the gravest defects, and they may end in the utter ruin of a harbour. Under such circumstances, also, costs easily rise to double; Cherbourg and Algiers are instances, if any be wanted, of immense estimates which proved utterly insufficient. Buenos Ayres has been wise to suspend her judgment.

When this plan was printed and published, a general cry



THE NEW PORT OF TRIESTE.—MODIFIED PLAN OF M. TALABO.

arose from the citizens, especially from the naval portion. Press, public, Bourse, and Chamber of Commerce all joined, for once, in an "expression of natural Conservatism," and the result was a protest (November 29th, 1862) praying that the "Bacino del Lazzaretto S. Teresa" might be spared for the City, and saved from the Monopolist. A host of pamphlets, plans, and counterplans issued from the press, advocating or opposing the thirteen to which allusion has been made; and it was understood, to the satisfaction of all, that the French Südbahn had yielded to the popular storm.

The next step was the consultation of Sir Charles Hartley by the Hafencommission, which seems to have sat *en permanence* till April 23, 1863. That eminent engineer, who brought no local prejudice to his work, remarked that no favour had been shown to the French Company and their employés beyond what their commercial enterprise deserved. After careful study he would have preferred a single long mole projected from the Quarantine basin, but he gave his opinion that the Talabot plan was the best of all those hitherto submitted to Government, with certain modifications, such as reducing the parapet and widening the entrances. The Commission accepted this expression with twenty-six votes out of thirty, and also discussed a ship-canal from Trieste Bay to Muggia Bay which had been proposed at a cost of three millions of florins. Still protests made their appearance on May 19, 1863, and June 8, 1864.

On April 13, 1867, five years after the first draught had been submitted, the "Talabot" reappeared in force under the title, "Il Porto di Trieste." The Imperial Government had determined that only the reduced breakwater and the four great northern moles opposite the railway station should be built, the other six being left for a future time. The project also underwent a variety of modifications by steps of which there are no published accounts; indeed I am assured that a few sheets of manuscript represent all the documents on the subject. For instance, the moles were reduced from a breadth of 95 metres (312ft.) to 80 metres (263ft.) except the northernmost which having been begun, was left 93 metres (305ft.) broad. The breakwater, which was nearly straight in the second Talabot plan was bent, outwards so as to facilitate entrance, and along the whole inner line the "block wall" was sunk perpendicularly from two to six metres in order that ships might lie alongside. These are a few of the crucial changes concerning which it is vain to consult experts; the latter are all more or less prejudiced either pro or con, and there is the latitude of assertion usual when questions of expenditure are complicated by politics.

The "Porto di Trieste" again proposed the highly unpopular measures of converting into railway ground the northern or Lazzaretto basin, which has been done, and the Darsena or railway dock which still remains (1875). Thus it at once made a gain, said its enemies, of 25,000 to 30,000 square fathoms, which, at 50 florins per fathom, represented a total of 1,500,000. The water room was greatly curtailed by the increased and inordinate depth of the quay, now thrown out a hundred more feet seawards, and the basins were seriously diminished by the four huge moles which, even in their shrunken forms, appear intended for warehouses and building ground. The silting up of the new port would be increased, and pushing forward the quay beyond where it is sheltered by the railway buildings would greatly increase the power of the Bora. The two passages between the breakwater and the moles are dangerously narrow; indeed, on a windy day, one marvels how sailing vessels could either enter or quit the "new port."

The press and public now openly said, "Insomma si sacrifica il tutto per la parte; e si erige la Società Francese a padrona assoluta del Commercio di Trieste." All attributed the evil to the desire, which was rather the necessity, of pleasing the house of Rothschild. And thus, despite the most energetic representations to the

Ministers of Commerce and Finance, the Sovereign authority was obtained on April 9, 1867; on the following 13th the convention was signed, and the works were expected to begin in that year.

The sum of 13,500,000 florins was guaranteed to the company, but of this 1,125,000 was advanced on July 1, before the works began, and the same amount was to be paid for the next twelve years. A further sum of 1,713,750 florins expressing interest, raised the total to 14,713,750 florins. The Südbahn was allowed to delay defraying its debt of 20,000,000 florins due on November 1, 1866. It was relieved of income-tax for twelve years, a boon calculated to represent 18,000,000 florins. The concession of its network was prolonged for fifteen years, and this was estimated from the balances to bring 150,000,000 florins into its coffers. Finally it was authorised (April 13) to maintain the tariff of freights established November 1, 1866, for the whole length of its concession, 99 years.

In this "leonine contract" the Südbahn evidently received everything and gave nought—in theory. In 1866, after paying interest, amortisation and reserve funds, its balance showed a clear dividend of 17,000,000 francs. Yet no demand was made from it. The secretary's report (April 18, 1866) naively says of its last bargain, "Ces conditions nous ont paru acceptables, elles suffisent pour nous mettre à l'abri de tout mécompte, et des améliorations considérables pour notre réseau se trouveront ainsi réalisées d'une manière certaine et prochaine, sans rien ajouter aux charges de la compagnie."

After vain attempts to annul, or at least to revise and modify the fatal concession, the city assembled on September 13th, 1867, a municipal commission, composed of M. F. Hermet, president, and Drs. Righetti and D'Angeli, the actual mayor (1875). Their report to the Town Council was printed in the *Cittadino*, of September 25th and 26th, 1867, and it is couched in the strongest language. It declares with an abundant display of figures:—

I. That the new port is wholly unnecessary, even in view of the Suez Canal being opened; that the Sacchetta, between the lighthouse and the Molo del Sale, the Canal Grande, and the Santa Teresa basin, would suffice for many years. Detailed calculations accompany this statement.

II. That the port is highly injurious to local interests. The Südbahn, an irresponsible company whose books cannot be inspected, after buying the Sormann, Preinitsch, and Panfilli estates, obtained gratis, with the object of building its "monumental station," the sites of the old slaughter-house, and of the pauper institute; an area estimated at a total of 300 million florins. Thus it monopolises the only ground where rivals can locate themselves, the sole line which leads out of Trieste with an ascent of 1:80 instead of 1,000 feet, within a few miles. The close basins, also, will be dangerous in case of a ship catching fire.

III. The company obtained the exclusive right (April 13th, 1867) to run rails, and to lay down tramways along the "rive" (quays), another evil to the one Austrian harbour which, under influence of the railway, had become from a purely importing centre, one also of export. The effect will be to make her an entrepôt, a French dependency in the hands of the Südbahn, a mere canal, down which the stream of trade will flow, like Buffalo, after she was unseated by Chicago. Her commerce will be a simple transit, monopolised by the Südbahn; the effects will be permanently to unsettle her position, and will cause vast losses to a city, where the ground-floors of the grandest dwelling-houses command high rents as magazines and stores.

IV. That the new port may give rise to political complications; on the other hand, it brings no compensating advantages. Including the value of the Lazzaretto basin, converted into ground, the cost to the State amounts to 217,000,000 florins; and a far larger

sum will not pay for spoiling the port by reducing its area to half size. The four great moles, thrust forward beyond the defences of the Carso escarpment, will make the seas higher, the Bora more likely to dash vessels upon the breakwater, and the entrance of the harbour more difficult and dangerous. The "Diga" will probably require a large and expensive counterdyke, or, at least, like the Malamocco of Venice, it will entail endless outlay for repairs. The Cloaca Maxima (Klutsch) and the series of drains opening upon the sea front, instead of being subject to the currents, will deposit their burdens to the detriment of public health.

V. That the old roads want only the following remedial measures:—

(a.) Deepening and enlarging the Lazzaretto basin. This might be done by filling up the smaller or eastern portion near the Lazzaretto-house, and the reclaimed ground would answer for the future railway station.

(b.) Widening and lengthening the existing quays, but not to the exaggerated extent of 165 metres proposed by M. Talabot, and taking care that all the masonry should rest upon arches.

(c.) Providing the quays with one or two more moles for landing and embarking goods, also built viaduct fashion, but not broadened to 285 feet nor lengthened to 775.

(d.) Building a quay along shore from the Molo Klutsch, or the Darsena pier, to the mouth of the lazaretto basin; it should also be provided with piers, and defended by a solid breakwater to the north, proceeding from the Batteria Santa Teresa.

(e.) If it be held necessary to defend the roads from the rare Libeccio, it would be sufficient to extend the Molo Santa Teresa some 550 metres by a breakwater, which might be floating or stationary.

(f.) And lastly, opening the Molo Santa Teresa to increase the scour.

As has been seen, the latter measure was strongly advocated by Dr. de' Rossetti; the necessity is recognised without a dissentient voice; there are absolutely no engineering difficulties to be met, and the expense would be trivial. Yet such is the local *vis inertiae* that nothing is done. Committees abound, but, like councils of war, they make no forward move. In 1873 a Commission came down from Vienna, sent in the usual huge report, and went the way of the rest. The only measures of improvement adopted during the last two years and a-half has been to deepen the Sacchetta, an area of 8,000 fathoms, whose bottom is literally a layer of coal and sewage. In the winter of 1874 a few mines were sprung, the blasting was done with dynamite at night, under the superintendence of M. Closse, C.E., and these trivial operations were kept up for a few weeks of intermittent work. Meanwhile, the new works will only tend to injure, at an increased ratio, the Sacchetta which the Romans wisely chose for their inner port, and which the moderns allowed to be silted up from 35 to 15 feet of water.

This very able and angry report ends with proposing and advocating a project submitted by the late Dr. Rafaelo Angelo Visentini, C.E. He proposed to prolong the Molo Santa Teresa at an expenditure of 7,092,750 florins, or a total of 9,092,750 florins if a breakwater be added from the Lazzaretto basin. These figures are a favourable contrast with the 18 millions, the 16 millions, and the 14,713,750 florins specie successively estimated by the French Company.

In 1868 began another mixed Commission of the Chamber of Commerce, composed of M. F. Hermet (president), M. M. Gregorutti and Sirovich (members), and Dr. d'Angeli (relatore, secretary, and reporter). This body, which concluded its labours on January 21st, 1869, again protested against the fatal Convention of April 13th, 1867, which had placed the port and the city in the hands of the Südbahn; it unanimously recognised the necessity of saving the Bacino del Lazzaretto nuovo; it altered the position and shape of the break-

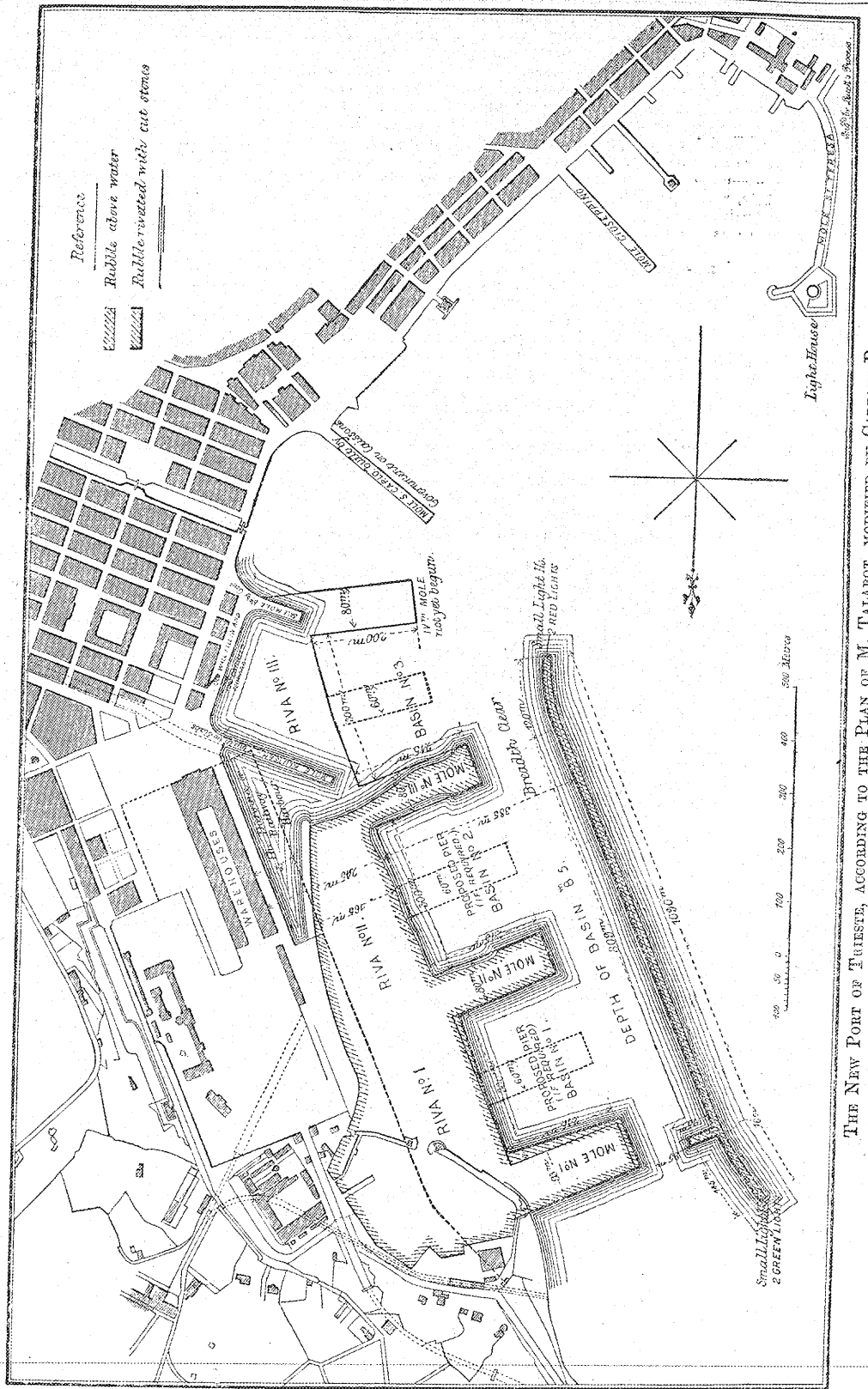
water; it repeated the time-honoured advice about opening the lighthouse-mole and building with arches instead of solid masonry, and it suggested the deviation of the Torrenti Martesin and Klutsch, with its annual discharge of faecal matter amounting to a million of cubic feet. But the battle for preserving the two old basins had been fought and lost; and the Commission regretfully found itself driven to a compromise. It adopted perforce the quays and moles of M. Talabot, but with various common-sense modifications. It proposed to enlarge the present piers. Giuseppino and San Carlo (Nos. 7 and 9); it reduced the reclaimed ground to a considerable extent; its northern quay was diminished in depth from 240 to 140 metres (*i.e.*, from 787 to 460 feet. Three of the four great moles shrank from 95 to 60 metres (*i.e.*, from 312 to 197 feet), and thus the basins were enlarged to the more reasonable extent of 260,000 square metres (*i.e.*, 310,960 square yards). The labours of this last Commission ended with proposing two plans, which were marked A and B.

A contained a quay, 160 metres (525 feet) broad from the railway station about the Lazzaretto basin to the Molo San Carlo in the mid-frontage of the "borgo" or new city: here I have said it is greatly wanted. In this line there would be four moles, with the following dimensions:—One (the northern), of 210 × 95 metres (689 × 312 feet); two central, of 215 × 60 metres (705 × 197 ft.); and one (southern), of 250 × 60 metres (812 × 197 feet). These four piers would form three great basins, each of about 8,700 square metres (10,405 square feet), or a total of 25,100 metres (30,920 ft.). The breakwater defending these basins was reduced to a mere wall, in length 1,50 metres (3,445 feet), bending seawards to the south, and affording a double entrance, northern and southern. This compromise has partly been adopted, but the four moles, of which three are now building, have been disposed between the filled-up Lazzaretto basin and the little Molo Klutsch at the bend of the bight, and the exaggerated dimensions of the piers, 215 metres (705 ft.) by 80 metres (262 ft.), and even 93 metres (305 ft.) in the northernmost, have been retained, whilst the breadth of the two basins is only 300 metres (984 ft.), and the width of the northern entrance is 95 metres (312 ft.), and the southern 160 metres (525 ft.).

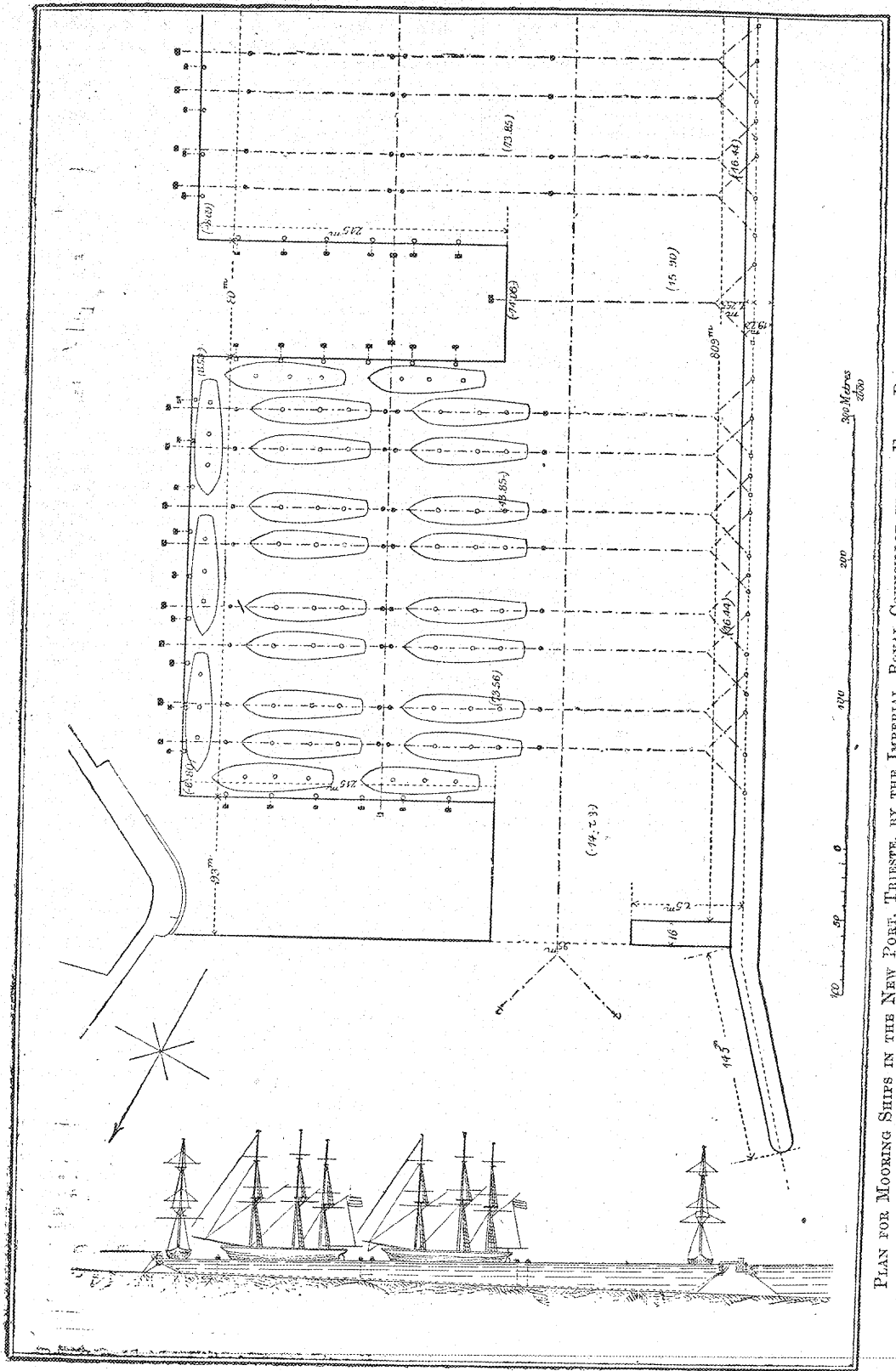
B was on a far more extended scale, surpassing even M. Talabot in extravagance of conception. It adds two large basins south of the railway to the three northern; it shows two breakwaters opposite the Südbahn station and the city with three entrances, respectively of 75, 80, and 65 metres (246,262,213 feet). With an eye to the future development of the port it also makes a long strip of basin by throwing out, as did M. Talabot, a third mole to the south-west, an arc of a circle from the lighthouse round the point of Sant' Andrea. I may safely predict that this project will not be adopted.

Upon the occasion of H.I.R. Majesty's visit to Trieste (April 2 and 3, 1875), M. Friedrich Burches (Hafenbauleiter und Inspector der Südbahn) published a detailed ground plan and sections of the works as they then stood, accompanied by a lithographed pamphlet (Trieste, March, 1875), of which he kindly gave me a copy. I am also indebted to that gentleman for a careful inspection of the works, which have been under my eyes for nearly two years and a half. The following is the information which his brochure affords.

The Südbahn Company has undertaken the new harbour on consideration of receiving from the I.R. Treasury the sum of Viennese florins 13,616,000 (silver), to be paid in twelve equal portions, distributed over as many years. [It is generally believed that nearly twenty millions have already been spent upon the works; the official reports own to 2,000,000 of excess.] The Governmental Controllers (Controls-Organen) are M. Jäger, the Baurath, and his subordinates, who forward three-monthly reports to the local chief of the Maritime

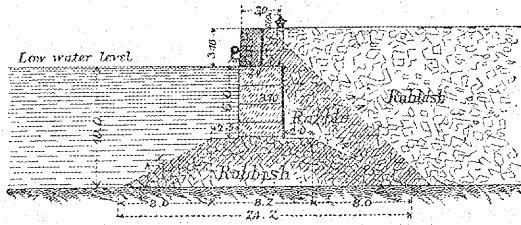


THE NEW PORT OF THIBESTE, ACCORDING TO THE PLAN OF M. TALADOT, MODIFIED BY CAPTAIN POPPOVITCH.

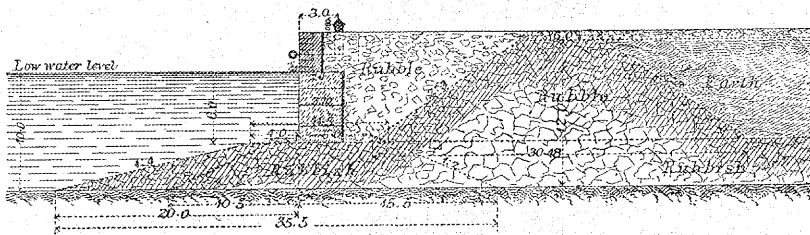


PLAN FOR MOORING SHIPS IN THE NEW PORT, TRIESTE, BY THE IMPERIAL ROYAL COUNCILOR IN THE EDILE DEPARTMENT, CAVALIERE DE MAUSER.

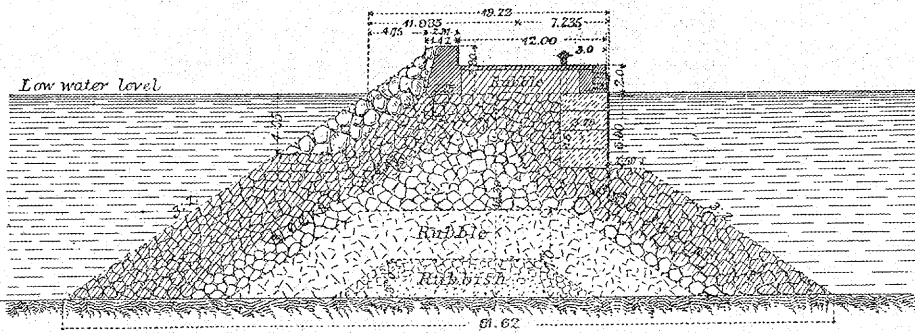
Section of the Wall, Mole I, and Riva I.



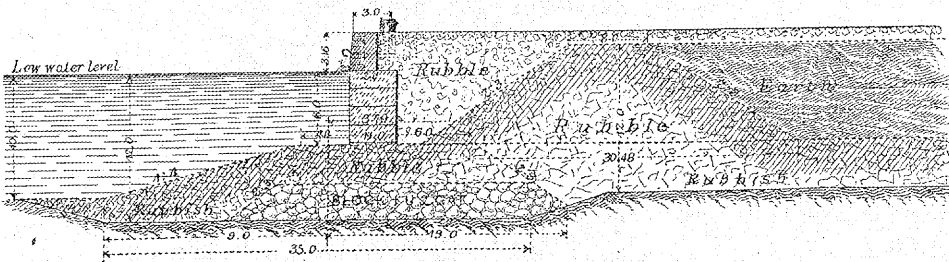
Section of the Wall, Mole II and Riva II.



Section of the Breakwater.

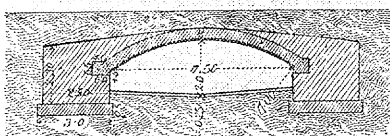


Section of the Wall, Mole III, Quay III, and Mole IV.



Martelin Channel.

Section with one opening.



Section with two openings.

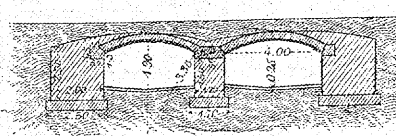


TABLE I.—MATERIAL FOR RUBBLE.

Quarries.	Transport.	1865.	1869.	1870.	1871.	1872.	1873.	1874.	Total cubic metres.
Camp Buchler	land	27,000	185,400	243,300	212,700	168,800	157,000	..	934,300
Cava Romana .....	"	..	..	122,000	63,000	93,000	110,600	47,400	436,800
Sestiana	sea	6,000	17,500	2,400	12,100	..	..	..	38,800
Monfalcone .....	"	..	..	87,900	220,600	89,200	..	..	377,100
Near Trieste	land	76,000	68,800	141,800	129,300	19,100	1,700	42,000	479,300
Around	sea	..	..	..	52,600	59,800	22,500	..	188,900

MATERIAL FOR STONE LAYING AND WALL BUILDING.

Camp Buchler	land	1,000	2,700	10,000	6,400	13,400	900	..	34,400
Cava Romana .....	"	..	..	..	62,500	43,500	1,100	..	107,100
Sestiana	water	63,000	139,100	202,400	287,700	319,600	80,300	1,100	1,073,300
Near Trieste	land	3,600	100	2,500	11,300	7,900	1,700	4,400	31,500
Around	water	..	..	4,800	5,700	21,500	4,000	..	36,000
Totals	land and water	177,300	413,600	816,500	1,044,700	835,800	379,900	148,900	3,816,600
Annual per centage..	..	4.6	10.8	21.6	27.6	22.1	10.1	3.2	100

[The total number of quarries was ten; some are of large size, especially in the sides of the Rojano Valley, behind the railway establishment, which has formed an extensive plain and building ground.]

dredgers, the two patented systems being the "Pater-noster" (*à gaudet*), an endless string of buckets like a rosary, and the spoon-shaped dredge *Lüffelbagger à cuiller*. One of the former, called the "Wall," can reach a depth of 12 metres. The transport was managed by ten steam-tugs (*schlepp-dampfern*), 100 large and 100 smaller barges, five locomotives working upon temporary rails, eight steam cranes, eight ships' cranes, 500 rubble-carts, and 200 vehicles, besides the apparatus required for making the Cyclopean blocks. The maximum of hands employed upon the works (1871) was about 2,000; the minimum (1875) is 200. The divers and blacksmiths receive a little more than the carpenters, who are paid two florins per diem; masons and sailors range from 1.50 to 2 florins; and labourers, at first procurable for 1.10 florins, now cost 1.20.

The dredging, also a considerable expense, has required repetition. The first simply cleared away the silt for the stone bedding, and this having to do with homogeneous matter, progressed fast enough. The second, rendered necessary in order to recover the depth of basins upon which the silt when pressed down encroached, was a slow and difficult operation, causing frequent slips and sinkings of the moles, the last (Mole No. 2) in April, 1875. It had to deal with heterogeneous matter, slime, fragments of stone, and small stuff mixed with natural blocks, some of them weighing 200 Zoll zentners (178 cwt. English). Thus the dredge-power was wasted in throwing up with the rubbish perhaps three times the amount of water. The greatest care also was required so as not to endanger the solidity of the adjacent works. The delay was increased by the necessity of working the layers metre by metre and of using divers to direct the dredges. The following table shows the cubic metres which were removed between the beginning of 1870 and the end of 1874:—

TABLE II.

Year.	Silt.	Small Materials.	Broken Stones.	Blocks.	Total.
1870	44,400	..	..	..	44,400
1871	23,800	..	..	..	23,800
1872	262,300	2,000	1,400	200	265,900
1873	57,300	18,200	19,800	2,000	97,300
1874	65,100	15,500	34,900	2,200	117,700
Total	392,900	35,700	56,100	4,400	489,100

The progress of the works in their several items is the object of

TABLE III.

Year.	Remblai.	Emmencement.	Quay Walls.	Dredging.	Total.	Proportions of each year.
1868...	169,600	64,300	..	..	173,900	1.0
1869...	271,800	135,700	10,200	71,500	435,200	2.5
1870...	597,000	207,800	20,200	44,400	869,400	5.0
1871...	691,000	349,700	5,200	23,800	1,069,700	6.1
1872...	429,900	309,300	16,500	205,800	1,011,500	5.9
1873...	289,900	75,000	21,600	97,400	483,900	2.8
1874...	143,400	5,500	12,700	117,700	279,300	1.6
Total.	2,532,600	1,230,300	86,400	596,600	4,355,900	

These figures prove that the fourth year (1871) had reached sixfold the amount of the first; the subsequent delay arose from the necessity of observing the rule recognised in all the older harbour-works of Trieste, namely, allowing a considerable time, never less than a year, for the subsidence and the consolidation of the new material thrown in. No. 1 basin was worked too hurriedly; the evil results were so apparent as to call for a long delay in finishing the others. It is now understood that the builders and contractors may take their time. No. 2 was carried out upon the new system, consequently it has not, like the former, required total reconstruction, and Nos. 3 and 4 may be expected to prove even greater progress. Table IV. (page 1,005) shows, in cubic metres, the amount of work carried on, according to contract with Government, by the several contractors working under the company:—

It remains only to consider the actual state of the works. Part of the condition of the new port was the deviation of the Fiumara (*burrone*) Martesin, which drains the Rojano Valley, north of Trieste, and of the Cloaca Maxima (*Klutsch*), to the south of the railroad establishment. The former has been completed for the last two years. The whole lower course is covered, and the double arched mouth is built with strong masonry. The *Klutsch* has not yet been attempted, for reasons which will presently appear.

The breakwater (*hafendamm*) has a total length of

TABLE IV.

Contractors	Period.	Remblai	Enrochement	Quay Masonry.	Dredging.	Total.
Dussand ..	{ 1868 to end 1873. 1870	1,064,000	1,091,000	73,700	...	2,228,700
Mauser ...	{ to end 1874. 1870	515,000	...	...	489,100	1,004,200
Willy	{ to end 1874. 1868	591,800	128,100	...	...	719,900
Various ...	{ to end 1874.	324,400	11,200	...	17,500	353,100
Company.	In 1874	37,300	...	12,700	...	50,000
Totals to end of 1874		2,532,600	1,230,300	186,400	596,600	4,355,900

1,090 metres (3,576 feet), curving slightly seawards at both ends, with small fanals, two green lights to the north, and two red to the south. In the former direction, at about 145 metres (475½ feet) from the end, is a spur-pierlet (traversa), nearly at right-angles, measuring 75 metres (246 feet) in length, and 16 metres (52½ feet) in breadth. It thus narrows the entrance to 95 metres (311½ feet), and there are some who complain that during northerly gales the passage is still too broad. This fine work was begun in July, 1868, in 16 metres (52½ feet) below the low-water line. The base was made only 61.62 metres (202½ feet) broad, and the consequence was that it gradually sank in a bulge 8 metres (26½ feet) deep: it was then broadened to 100 metres (328½ feet). The foundation consists (1) Klein (small) material, (2) bruchstein, or stone rubble, (3) blöcke, or large blocks, and (4) cut stone (pflasterung). The original height of the terreplein or platform was to be 16.30 metres (53½ feet) from the base, but the sinking increased it to 24.30 metres (79½ feet); the estimate was for 905,000,000 cubic metres, or ⅓ of the whole, but it now represents 52 per cent. Seawards it is fronted by large untrimmed blocks, and by a large parapet (bexronungsmauer,) whose crest is 1.42 metres (4½ feet) broad; the terreplein for landing goods measures 12 metres (39½ feet), and is provided with metal rings and substantial posts of cut stone (vertäuungsobjecte) for making fast. The inside face has now a clear depth of 6 metres (19½ feet), so that ships can lie alongside, the original plan being only 2 metres: here the facing is of five "Cyclopean blocks," each 3.70 metres broad (12½ feet) by 1.50 metres (4½ feet) deep, and the upper are revetted with cut stone. The fatal objection to this splendid construction which was ended in November, 1874, after six years and three months of work, is that it fronts between west south-west (Ponente Libeccio) and south-west (Libeccio) whence storms very rarely come; it is thus thoroughly open to the most violent and dangerous wind, the Bora (east north-east, and partially so to the turbulent and troublesome Sirocco (south-east). In fact, it is unique, a breakwater to leeward not to windward.

No. 1 basin together with No. 1 (northern) mole are so far finished that they may be opened before the end of the year. The shape of the former, unlike its two neighbours, is a trapezoid, the breadth of the tail being greater than that of the head, 93 metres (305½ feet). It was found necessary to add to the inner side a slice measuring at the base 5.78 metres (19 feet), and at the head 3.20 metres (10½ feet). The work is good, and reflects the greatest credit on Mr. Bömches and his energetic staff. The slope of the base (Bruchstein und Kleinmaterial) has been widened from 1.2 to 1.4, and it is faced, like the breakwater, with cyclopean blocks and cut stone. The length, as in the case of the two others, is 215 metres (705½ feet). The riva, or joining quay of cut stone, connecting Moles No. 1

and 2, has a length of 300 metres (984½ feet); it has sunk and slipped so much along the whole line that the walls have had to be reconstructed, and their bases to be dredged a third time. Thus each basin represents 64,500 square metres, which may allow seven large steamers to lie alongside the walls. The depth of water was originally determined to be 6.50 metres (21½ feet), but a Government order increased it to 8.50 metres (27½ feet), when the new basin of Marseilles (1871) and those of the Suez Canal do not exceed eight metres.

No. 2 basin is in progress; the *enrochement* for both pier and quay and the *remblai* have been done for some years. The northern mole (No. 2) is narrower than its finished neighbour, 80 metres (262½ feet), instead of 93 metres; yet the size appears excessive, unless it be intended as a building ground for warehouses, which will pay the company, but not the city. It has also required an extensive modification of the base, strengthening the stone profile and repeated dredgings; moreover, it has by no means settled, and it gave way very seriously in February, 1873. The quay No. 2 is beginning to show above water, and the mole No. 2 is finished except the masonry at the southern half.

No. 3 basin has not yet been begun. The northern mole No. 3 will be in all points like No. 2. The delay in this part of the works was caused by the Government insisting that until at least one of the basins have been opened, the little Darsena, with its quay, where most of the large English steamers load and unload, and the Molo Klutsch, useful to native craft, shall not be meddled with. Thus the company has found the greatest difficulty in building mole No. 3, the narrow space to the south hindering the work of tugs, barges, and dredges. As yet only the head of this pier has assumed a finished form, and there was a subsidence in the filling in at the root about March, 1875. No. 4 mole, of M. Bontoux' port, will, if made, obliterate the Molo Klutsch and the Molo del Sale; but it is strongly to be hoped that local opposition may avert this final blow. The last proposal on the part of the Maritime Government was to fill up the Darsena and to omit the third basin, allowing that between the Molo del Sale and Klutsch to the Molo retain its place.

Part of the project is to reduce the level of the ground occupied by the whole railway station behind or east of the new port, and thus to render the first tunnel unnecessary. It was 10.12 metres (33½ feet) above mean water, and it will be lowered to 3.16 metres (10½ feet). This work is progressing satisfactorily.

The stranger landing at Trieste sees with surprise the vast space of ground now prepared for building at the far north of the city; there will in fact be an old town, a new town, and a port town. The public and the local authorities have done their utmost to stop the works, but in vain. They complain that the diminutive basins will not provide for the ever-increasing trade of the chief emporium of Austria, and that the gigantic moles, intended to pay ground-rent to the company, will do immense injury to all the highly valuable warehouse property elsewhere. They also complain of the exorbitant expenditure, nearly two millions of pounds sterling, not to speak of immense claims which may be anticipated on the part of the company; and of the irreparable mischief done to the roads by increasing the deposit of silt; this, indeed, can be repaired only by removing, which would cost nearly as much as building, the works. The malcontents, by no means hoodwinked by the letters and pamphlets which periodically appear, see a deeply-laid plan for taking away the freedom of their port. They declare that their city, instead of being a place of trade, will be a mere line of transit for the benefit of the Südbahn. But their efforts are in vain; all the protests of December 12, 1861; of May 19, 1863; and of June 8, 1864, have had the same fate. Shortly after the middle mole (No. II.) had given way bodily (Feb. 1873), a deputation set out for Vienna to report the state of affairs, yet the Chambers were officially

assured, within the shortest possible interval, that the best news had come from the new Port of Trieste.

The company, however, must now continue its work or leave them to be continued by the Imperial Government. The basins may be kept clear by the expensive process of perpetual dredging, and, possibly, contrary to public opinion, the rest of the roads will, to a certain extent, be defended from silting up. The immense tract of building-ground obtained by quarrying the hillslopes behind, and by reclaiming from the sea, will eventually become valuable, and will enable the builders to recoup their enormous expenditure. Perhaps the ultimate effect of the harbour may be beneficial especially if it result in turning public attention to Muggia Bay, the true port of Trieste.

What Austria does Hungary must do, consequently Fiume has imitated her northern rival. The expenditure will, perhaps, not reach the half of that described above; the situation of the new harbour is far more central, and the works have not to meet the same difficulties. But the pieces of solid masonry where floating breakwaters would have served, may prove as injurious to the roads of Fiume as to those of Trieste.

REVISED PLAN OF THE PORT OF TRIESTE.

The Talabot project, modified and approved by the Commission appointed April 28, 1862, showing the defects remarked by the majority of navigators, ship-owners, and others of the town, and marking the necessary corrections.

REFERENCES.

The fillings in of earth (*a*); the quays (*b*); the moles (*c*); and the dyke or breakwater to be built (*d*), are darkly shaded.

The dyke of defence (*e*) at the lighthouse point; the projected moles (*f*); the cutting in the Santa Teresa pier (*g*); and the port of Sant' Andrea (*h*); are simply outlined to show that these works were at present suspended.

The new "mandracchio" (basin, or inner port) for coasting craft is marked by (*i*).

N.B.—The numerals in the port represent Viennese feet.

Along the outlined quays would be horse tramways, flanked by warehouses, to protect the goods from weather. Behind, or landwards, there would be a space for the free thoroughfare of carts, &c., the total demanding a width of about 160 feet.

ACCESSORY EXPLANATIONS.

The quays and all the new works, darkly shaded, are lettered as follows:—

K. Quays and pier flanking the new lazzaretto, the latter to be retained.

L. The new quay, securing ample space for the railway, and forming the large and ample basin (M); concentrating the torrent-drains "Klutsch" and "Mortasin"; and securing from the Bora (north-easter) the vessels made fast to the moles R. Hence also the advantage of preserving the new lazzaretto.

N. New dyke, intended as a substitute for that marked *a*, and, together with the pier (K), making the basin safe.

O. P. New approaches by which ships could enter and depart whatever winds may be blowing.

R. Moles or piers improved and pierced for the free passage of water.

The third ballot for Fellows in the Royal Aquarium and Summer and Winter Garden was held on the 1st inst. Eight hundred and forty-two ladies and gentlemen came up for election, of whom six hundred and twenty were elected. The executive have secured a large site for a skating rink. The first tank was filled with water on the 1st inst., and the fish may now be seen disporting themselves therein.

Some fear has been entertained that the disease called *pebrine* has attacked the silkworm in certain parts of Japan, as the corpuscles which were the invariable concomitants of the disease in France and Italy have been disclosed by careful microscopic examinations of the silkworm of Japan. It is stated that M. Pasteur announced the existence of these corpuscles in the Japanese silkworm as early as 1865. There is, therefore, nothing to warrant the conclusion that *pebrine* exists in Japan.

The production of the Westphalian portion of the coal basin of the Ruber, amounted in 1873 to 16,213,964 tons. The corresponding production in 1874 was 15,351,131 tons, so that the output declined last year to the extent of 5½ per cent.

CENSUS OF INDIA.

The memorandum on the census of British India contains some interesting particulars with regard to the manner in which this great work of enumerating the people was effected. The census was not carried out in the various provinces in one uniform system. In Bengal, owing to the want of administrative machinery from the great expense anticipated to supply this need, and to the vast extent of sparsely populated territory in Assam, which was then under Bengal, in Cooch Behar, and in Chota Nagpoor, it was determined to make no attempt to obtain a synchronous enumeration of the people, or to deal with the precise condition, in all respects, of every individual. The general plan adopted in this province was to have lists prepared of the villages and hamlets, which were made over to the police for supervision. In each village two or more residents were selected, who, in complimentary letters, were requested to act as enumerators, and to submit lists of the houses in these villages, with the name of the principal occupant of each, the correctness of a certain number of these lists being tested by the police. Though the enumerators would, doubtless, have preferred to be paid for their trouble, it was found that the office was, for the most part, coveted as an honourable distinction, and the cases in which legal measures had to be adopted to enforce them to complete the tasks they had undertaken were altogether exceptional, and were confined to two districts. In one, Thannah, in Hooghly, however, the names set down as enumerators were found to be those of persons unable to read or write; the educated people having threatened to beat the watchmen if they put in their names, and the men having accordingly entered those of persons of whom they were not afraid. There is some reason to think that the enumerators, in a few cases, used their power to extort a small tax from the people, but no great amount of oppression appears to have been practised.

In a large number of villages difficulty arose from there being no resident able to read; in such cases, and generally in less civilised districts, paid enumerators had to be employed, or the work was undertaken by the police. The census in towns was, as a rule, effected by the municipal authorities. The large floating population on the various rivers was counted by a census of the boats at each landing place. Travellers by land were reckoned at the several serais or halting places. In the hill tracts of Chittagong, and in the Khasia hills, each chief took the census of his own clan. In the Southal pergunnahs the people were enumerated by their national method of counting, knots being tied in a number of strings of different colours, to distinguish males from females, and children from adults. In some parts of Orissa the agents employed could only write in the customary manner, with an iron style, on strips of palm leaves, from which the returns had to be afterwards copied out in printed forms. On the tea plantations of Darjeeling and Assam the census was taken by the planters. None was attempted in the Saro hills, or in the wilder parts of the Naga hills and Luckimpoor.

For three years the people were instructed in the object of the census, and experimental enumerations were made, so as to familiarise their minds with the idea and allay any fears they might entertain. In most instances the forms were filled in beforehand, and only corrected on the night in which the actual enumeration was taken. Over very large tracts of country the final counting took place in a single night; in the Rajshahye and Dacca divisions—together, as large as England—on the 15th, and in the Patna division on the 25th of January; and so far as the regulation districts are concerned, it might probably be hereafter effected in one day without difficulty. In the non-regulation divisions of Chota Nagpoor and Assam, however, the enumerators, who were sent out in November, did not return from their work till February, March, or April.