Souvenir Cinchona tercentenary celebration and exhibition at the Wellcome Historical Medical Museum ... London ... / Henry S. Wellcome ... director, L.W.G. Malcolm ... conservator.

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CINCHONA
TERCENTENARY CELEBRATION
AND
EXHIBITION
1930

THE WELLCOME
HISTORICAL MEDICAL
MUSEUM
LONDON

CINCHONA

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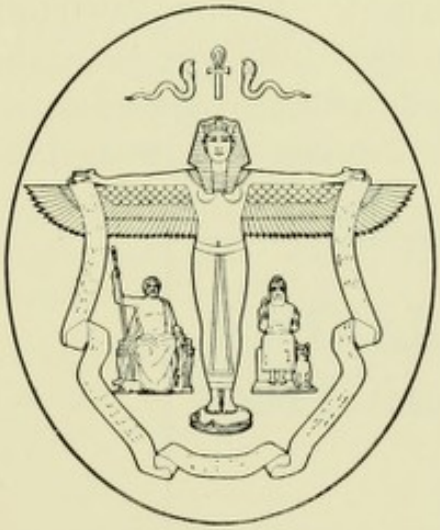
54, WIGMORE STREET, LONDON, W.1



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CONSERVATOR

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FOREWORD

The Cinchona Tercentenary Celebration has been organised to mark the first recognised use of Cinchona Bark by Europeans.

An extensive collection of exhibits has been arranged to illustrate the romantic history of this remarkable remedial agent, the addition of which to the world's materia medica, has, for three hundred years, proved itself to be of incalculable value, especially in tropical regions. The lives of untold millions have been saved by the use of Cinchona Bark and its active principles.

From the time when the therapeutic properties of Cinchona Bark became known to the Old World, until, and since, the scientific researches resulted in the discovery of quinine and other derivative constituents of the bark by Pelletier and Caventou, and others, there have occurred many interesting phases in the history of Cinchona.

Linked up with the history of Cinchona Bark are the pioneer exploring expeditions by the venturesome Spaniards in South America, its introduction to all parts of the world, especially by Jesuit Missionaries, and also the later research expeditions of French, Spanish, British and other scientific investigators.

This Exhibition illustrates in outline the historical development from the time of the introduction of the bark until to-day, when experimental researches on its active principles are still being continued.

The therapeutic properties of the Cinchona Bark are believed to have been well known to the native Indians of Peru, who confided their knowledge to the Jesuit Missionaries when they established missions in the country after the conquest by Pizarro in 1527.

William Arrot, a Scotch surgeon, who visited Peru in the early part of the eighteenth century, states that the opinion then current at Loxa was that the qualities and the use of the Cinchona Bark were known to the Indians before any Spaniards came among them.

La Condamine, as well as Jussieu, heard the same statements, which are supported by Anton Bollus, who lived in Peru in 1649, and these statements were generally prevalent at the close of the 17th century.

As regards the first actual medicinal use of Cinchona Bark in 1630, there are statements by distinguished authorities that when Don Juan Lopez de Canizares, the Spanish corregidor of Loxa, was taken ill with an intermittent fever he was cured by an Indian cacique of Malacotos, who revealed to him the curative properties of the bark and the proper way to administer it.

The Jesuits soon afterwards despatched supplies of the Cinchona Bark to Spain. Rompel states: "For the earliest transportation of the bark we must thank the Jesuit Barnabé de Cobo (1582–1657), who . . . in his capacity of Procurator of the Peruvian Province of the Order, brought the Bark from Lima to Spain . . . and Rome in 1632."

In 1621, Don Luis Geronimo Fernandez de Cabrera y Bobadilla, fourth Count of Chinchon, married Ana de Osorio. Some time after her death he married his second wife Francisca Henriquez de Ribera, in 1628. In the same year Count Chinchon was appointed Viceroy of Peru; and soon after he, and the Vice-reine, proceeded to Peru to take up their duties. It is quite certain that his first wife, Ana de Osorio, never visited Peru, and any reference to the Countess of Chinchon in connection with the history of Cinchona must definitely be ascribed to the Vice-reine, Francisca Henriquez de Ribera, the second wife of the fourth Count of Chinchon.

The original records prove that both the Count and Countess of Chinchon suffered severely from fever; and they also indicate that, in 1638, the Court Physician, Dr. Juan de Vega, cured the Countess of this malady by the administration of Cinchona Bark at Lima.

The Vice-reine, Countess Francisca Henriquez de Ribera, died, and was buried in 1641 at Carthagena in Colombia, then a Province of Peru.

The distinguishing botanical name of the Genus *Cinchona* was invented by Linnæus. This title was suggested by the titular name "Chinchon" of the Countess Francisca Henriquez de Ribera, the Vice-reine, and second wife of the Viceroy of Peru.

In 1740, Linnæus made his first reference to "Cinchona" as *Quinquina Cond.*, and in 1742 he invented the word *Cinchona* for the Genus ("Quinquina *Condamin. Act. Gall.*, 1738"). *See Frontispiece.*

The name Quinaquina, Quinquina, Kinkina, or Kinakina, in use until Linnæus invented the name *Cinchona*, has been derived from the Quichuan native Indian language of Peru. Markham says: "In Quichua, when the name of a plant is re-duplicated it almost invariably implies that it possesses some medicinal qualities."

It will be noted that both the native Indian and generic words have formed the root-stems for the designations, not only of the bark, but for its derivative constituents.

The purpose of my visit to the indigenous South American Cinchona forests in 1879 was to investigate and study the methods employed in stripping, preparing, drying and packing the Cinchona Bark for transport, also to study the conditions under which these operations were being carried out.

Furthermore, I gave special consideration and attention to the practicability of reforestation, and scientific methods by which plantations could be established for the cultivation of the highest grades of Cinchona trees on the sites of the ancient indigenous forests which had been devastated by the destructive methods practised in gathering the bark in former times. Unfortunately, no effective measures have been taken to protect and conserve the Cinchona trees in the principal native forests, with the result that the bark-producing countries of South America have lost their world-wide market, and a substantial revenue.

The organisation of this Exhibition has been made possible by the cordial assistance and willing co-operation of Scientists and Learned Societies in various parts of the world. My thanks are due to these, and also to the members of my staff who have heartily and zealously devoted themselves to its preparation. In this connection special credit is due to Mr. L. W. G. Malcolm, Conservator of this Museum.

HENRY S. WELLCOME.

December, 1930.

Chronology of the Principal Explorations and Personal Investigations of the Native Cinchona Forests since 1700

1735. La Condamine and de Jussieu.
1735. Ulloa.
1735. Arrot.
1753. de Santiesteban.
1761. Mutis.
1776. Renquifo.
1776. Haenke.
1777. Ruiz, Pavon and Dombey.
1778. Tafalla.
1785. de Bezares.
1799. Humboldt and Bonpland.
1802. Caldas.
1816. Bonpland.
1827. Poeppig.
1833. Ledger.
1843. Weddell.
1844. Karsten.
1846. Seemann.
1847. Delondre.
1849. Santa Maria.
1849. Spruce.
1851. Weddell.
1852. Markham.
1852. Hasskarl.
1859. Markham.
1861. Cross.
1879. Wellcome.

CINCHONA SUCCIRUBRA

Habitat Loxa

From Loxa, Ecuador, then a province of Peru, the first Cinchona Bark used by Europeans was obtained

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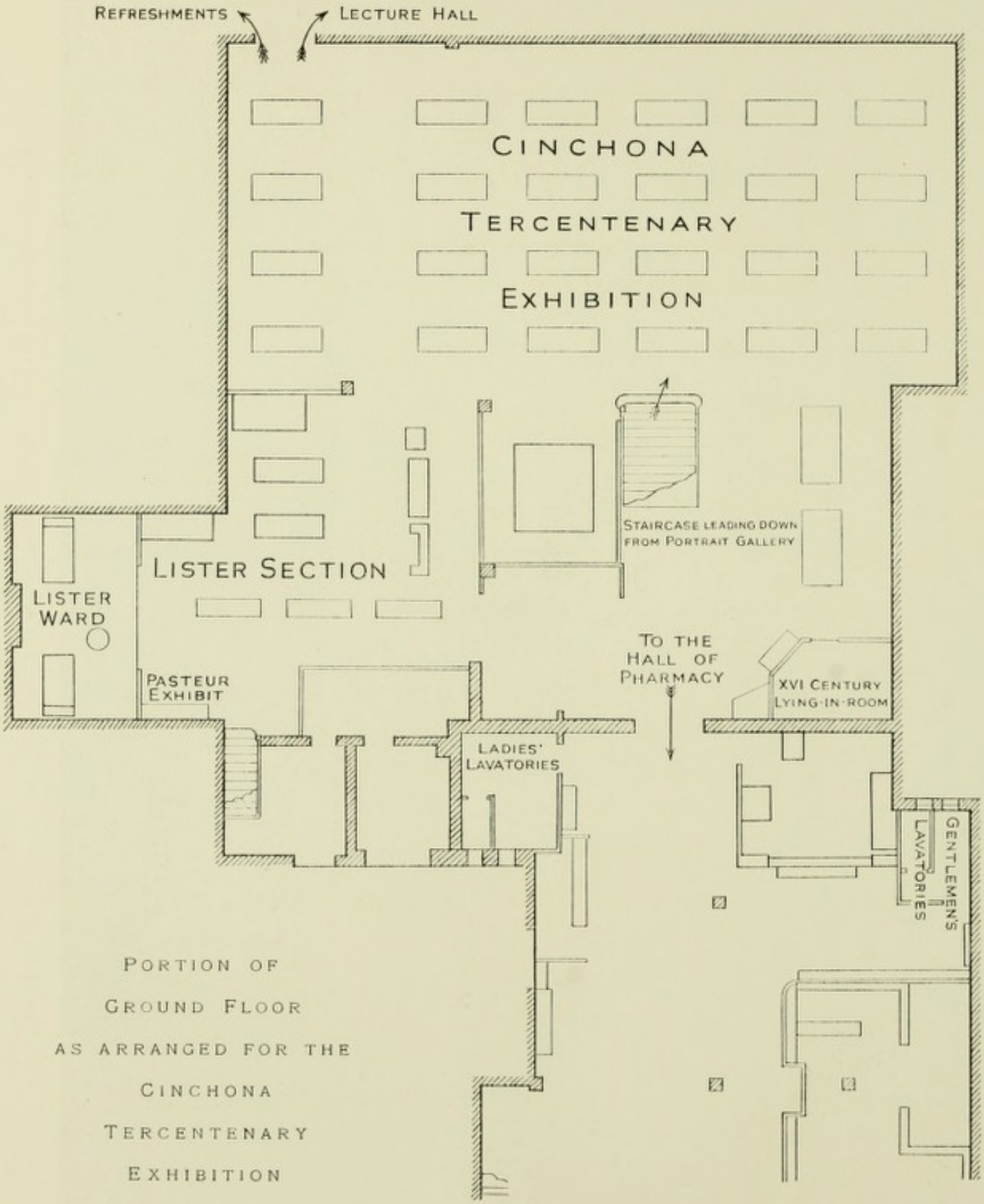

PORTION OF
GROUND FLOOR
AS ARRANGED FOR THE
CINCHONA
TERCENTENARY
EXHIBITION

GUIDE AND CATALOGUE

EXHIBITION

CINCHONA TERCENTENARY CELEBRATION

AT THE

WELLCOME HISTORICAL MEDICAL MUSEUM

In the following Catalogue the original and historical nomenclature has been retained where possible.

EXHIBITS FROM

HIS MAJESTY ALPHONSO XIII, KING OF SPAIN

1. Three of the original serons of Cinchona Bark brought from Peru by Ruiz and Pavon on their return from the expedition sent there by Carlos III in 1777.
2. Specimens of Cinchona Bark of Loxa and Calisaya Bark sent to Spain by the expedition of 1777 (Ruiz and Pavon).
3. Samples of the original interior packing of the serons in which the Bark was sent.

EXHIBIT FROM

HIS EXCELLENCY THE AMBASSADOR OF SPAIN

4. Arms of the Pizarros.

EXHIBITS FROM THE

BUREAU TOT BEVORDERING VAN HET KININE-GEBRUIK AMSTERDAM

PHOTOGRAPHS

5. The virgin forest in Java.
6. Clearing the virgin forest.
7. The cleared field terraced to avoid the washing-away of the fertile top-soil by tropical rainfall.
8. *Cinchona Ledgeriana* in blossom.
9. Collecting the Cinchona Seed.
10. Selecting the Cinchona Seed.

11. Sowing the Cinchona Seed on the seed-beds.
12. Young Cinchona Plants in nurseries.
13. Grafting of *Cinchona Ledgeriana* on to *Cinchona succirubra* stock.
14. Nurseries with grafts of *Cinchona Ledgeriana*, 5 months after grafting.
15. Plantation with 20-year old grafts of *Cinchona Ledgeriana*.
16. Gathering the Cinchona Bark.
17. Drying the Cinchona Bark in the sun.
18. A drying installation.
19. Cleaning the dried Cinchona Bark.
20. Packing the Cinchona Bark.
21. Transport to the station.
22. Famous *Cinchona Ledgeriana*-graft.
23. Self-portrait of Albert Dürer.

    The famous painter, Albert Dürer (1471–1528), was infected with malaria during his visit to the province of Zeeland. In the Museum at Bremen there is a pen-drawing in which he depicted himself with the upper part of his body exposed. His index finger points to that part of the abdomen where the spleen is situated and where a yellow spot is placed. Above the drawing appears the words: Do der gelb fleck ist und mit dem finger drawff deut, do ist mir we (where the yellow spot is and the finger points to it, there it hurts me).

    This drawing must have been made about the year 1520, and it is believed that Dürer sent it from Holland with a letter to his doctor in Nuremberg in order to obtain advice about the disease from which he was suffering.
24. Photograph of P. J. Pelletier.
25. Photograph of J. B. Caventou.
26. Statue of P. J. Pelletier and J. B. Caventou.
27. Madonna della Febbre.

    A painting of the Holy Virgin, which has for centuries been called the Madonna della Febbre, and which is now in the crypt of St. Peter's, Rome. It appears originally to have been in the portico of the old basilica; Gregory VIII had it transferred to the sacristy, and Paul V gave it a place in the crypt when the old church was pulled down at the beginning of the 17th century. A copy.
28. Fever Tree.

    An illustration taken from a work by Prof. Fr. Torti, of Modena University, entitled: "Therapeutice specialis ad febres periodicas perniciosas" 1712. All the names of known fevers are inscribed on the tree.

    For the reason that the curative property was confined to the bark, Professor Torti placed the names of those fevers which the bark cured with certainty, on branches entirely covered. Those fevers which the

bark did not usually cure had their names engraved on parts of the branches stripped of bark; and those fevers which the bark sometimes cured, and sometimes not, were indicated on portions of the branches partially covered by bark.

29. Spirit of the Marshes. By Maurice Sand, 1861.

30. Four Photographs of the Castle of Chinchon.

31. Photographs of three Frescoes.

In the dispensary of the Hospital de Santo Spirito, in Rome, there are preserved three quaint frescoes relating to the first use of cinchona by Europeans.

The first depicts Spaniards in Loxa buying Cinchona from an Indian.

The second fresco depicts the Countess of Chinchon receiving a cup containing a draught of Cinchona.

The third shows Cardinal Juan de Lugo administering Cinchona personally to the sick in the Hospital de Santo Spirito.

La Malaria, after Hébert, 1850. Original in the Musée d'Orléans.

Temple de la fièvre, after Ch. M. Challe.

In the reign of Pope Pius VI (1775-79), this round church was pulled down and in its place the new sacristy of St. Peter's was erected. Behind this church there is found the round church of "S. Maria della Febbre," of which the French painter, Ch. M. Challe (1718–1778), made a sketch in crayon.

PUBLICATIONS

32. "Chininum, Scriptiones Collectæ, anno MCMXXIV."

33. "Malaria and Quinine and Malaria and Chininum."

34. "Malaria en de groote Cultures."

35. Dr. Destouches' "Essai sur les préparations pharmaceutiques du Quinquina." Spanish and French Edition.

36. Calendars and Blotting Pads, 1928, 1929, 1930 and 1931.

37. Posters for use in the Dutch East Indies, Jugo-Slavia, Tunis, Algeria and Morocco.

MISCELLANEOUS

38. Packing.

Special packings, such as those used in the Argentine, Greece, etc.

39. Terrestrial Globe.

A globe, on which are indicated in red the malarial regions of the world.

EXHIBITS FROM THE
BOLIVIAN CONSULATE-GENERAL, LONDON

40. The National Flag of Bolivia.
41. Map of Bolivia.

EXHIBIT FROM THE
CHELSEA PHYSIC GARDEN, LONDON

42. Wardian Container.

    Specially designed by Nathaniel B. Ward, F.R.S., F.L.S., Master of the Society of Apothecaries, for the purpose of transporting the living Cinchona plants from Central America to India.

EXHIBITS FROM THE
ECUADORIAN CONSULATE-GENERAL, LONDON

43. The National Flag of Ecuador.
44. Map of Ecuador.

EXHIBITS FROM
HOWARD & SONS, LTD., ILFORD, LONDON

CINCHONA PLANT SPECIMENS

45. *Cinchona Calisaya*. Specimens grown by John Eliot Howard, F.R.S., at Tottenham.
46. *Cinchona Calisaya* (Ledger). Amani—Leaves dark green with red spots.
47. *Cinchona Calisaya*. Amani—Flowers yellowish white.
48. *Cinchona* hybrid. Leaves bright red.
49. *Cinchona* hybrid. (*Ledgeriana* × *succirubra*). Flowers yellowish-white. Buds and undersides pink.
50. *Cinchona* hybrid. Leaves green (medium).
51. *Cinchona Calisaya* (Ledger). Broad leaves, grown at Tottenham, in 1880, by J. E. Howard.
52. *Cinchona Calisaya* (Ledger). (Another specimen). Broad leaves, grown at Tottenham, in 1880, by J. E. Howard.

53. *Cinchona Calisaya* (Ledger). Narrow leaves, grown at Tottenham, by J. E. Howard, 1881.
54. *Cinchona Calisaya* (Ledger). (Another specimen). Narrow leaves, grown at Tottenham, by J. E. Howard, 1881.
55. Three Mounted Specimens of Cinchona Seeds.

Specimens of Cinchona Barks

56. *Cinchona robusta*, 1883.
57. Cinchona Bark, No. 19. From Government Plantation, Neddivattan. Planted 1862. Collected 1880.
58. Cinchona Bark, No. 28. Government Plantation, Dodabetta. Planted 1863. Collected 1880.
59. *Cinchona succirubra*. West Coast of Africa, 1888.
60. *Cinchona succirubra*. Jamaica, 1881.
61. *Cinchona* hybrid. *(Calisaya × succirubra)*. Java, 1884.
62. *Cinchona officinalis* (Bonpl.). Ceylon, 1880.
63. *Cinchona exosteum Peruvianum*. Samples, together with letter to J. E. Howard, from Daniel Hanbury, describing samples as "false cinchona," 1854.
64. Quina de Nagenal Caratodo Bark. Paris Exhibition, 1867.
65. *Cinchona Calisaya*, var. *Josephiana*. Root Bark.
66. *Cinchona nitida*. Grey Bark.
67. *Cinchona Calisaya* (Wedd.).
68. *Cinchona Chahuarguera*—Coarse Crown Bark.
69. *Cinchona Boliviana* (Wedd.).
70. *Cinchona erythrantha* (Red Bark). East Indies.
71. *Cinchona caceifera Condaminea tinctonia*.—Note by J. E. Howard, inside jar, "Given me by M. Guibourt, June, 1852."
72. *Cinchona Calisaya*, var. *Ledgeriana*. Java.
73. *Cinchona villosa*. From J. E. Howard's specimens.
74. Bark from St. Helena. (From The Imperial Institute, January, 1918).
75. *Cinchona Pahudiana*. Original Bark, 9 months under moss; removed from trees in 1866. Ootacamund.
76. *Cinchona officinalis*, var. *Bonplandiana colorata*. Colorada del Rey of Loxa.
77. *Cinchona Peruviana* (Howard). "2 Huanuco jaune pâte" (Delondre, Pl. IV).
78. *Cinchona Pitayensis*. From a new district of La Cruz Popayan, 1870.
79. *Cinchona, sp.* With MS. Note (? in Pavon's writing), "Quina de Quito y de los Montes de Jaen."
80. "Silvery Lima Bark," 1869.

81. "Ladenbergia Bogotensis (Karsten) Quina Nova."
82. *Cinchona purpurea*. Carabaya Bark, 1848.
83. *Cinchona micrantha* (Ruiz and Pavon), Grey Bark.
84. *Cinchona tucujensis*. Original specimen (Karsten).
85. "Laplacea Quinoderma."
86. "Fine curly Pitaya." D̄D̄ mark, January, 1879.
87. *Cinchona cordifolia* (frutos largos). Authentic specimen.
88. *Cinchona lutea* (Pav.). White Loxa Bark. Jussieu.
89. *Cinchona tucujensis*. "Puerto de Caballe IV," 1869.
90. *Cinchona Josephiana* (Wedd.). Fine specimen—in Paris Exhibition, 1867.
91. *Quina nova*, with epiderm.
92. *Cinchona ovata*, var. *rufinervis* (Wedd.). "*Morada ordinaria*."
93. *Cinchona ovata*. Carabaya, Quill, 1850.
94. *Cinchona officinalis*, var. *Uritusinga*, Ceylon.
95. *Cinchona parabolica*.
96. *Cinchona Pelletieriana*. South America. Source of Aricine.
97. *Cinchona lancifolia* (Mutis). Fibrous Carthagena Bark.
98. *Cinchona Palton*. Carthagena Bark. South America.
99. *Cinchona cordifolia*. October, 1869.
100. *Cinchona lanceolata*—Hojas de Lugina. Peruvian Lancifolia.
101. *Cinchona viridiflora* (Pavon).
102. *Cinchona lucumæfolia*.
103. *Cinchona, sp.* Guibourt's "Nova Colorada," 1825, p. 164. "Certainly from Peru, contains a little Cinchonine."
104. *China Loxa*. (With letter in jar to J. E. Howard, from T. Mastenbrock of Amsterdam).
105. *Cinchona scrobiculata*, or *Cinchona erythroderma*.
106. *Cinchona Calisaya*, var. *Zamba* (Wedd.). A Paris Exhibition sample, J. E. Howard, 1868.
107. *Cinchona coccinea*.
108. *Cinchona erythrantha*. From Guayaquil. In Paris Exhibition, 1867.
109. *Cinchona officinalis*, var. *Condaminea*. Ceylon.
110. *Cinchona Calisaya*. "Flat Calisaya." Bolivia.
111. *Cinchona Calisaya*. Bolivia.
112. *Cinchona succirubra*. Renewed Red Bark.
113. *Cinchona Calisaya verde*. Bolivia, 1884.
114. *Cinchona purpurea*, var. *Carabaya*.
115. *Cinchona magnifolia* (Pav.). (?) Peru.
116. *Cinchona subcordata* (Pav.). "Ash Bark of Pereira." Original specimen.
117. *Cinchona ovata*, var. *inedita, macrocarpa* (Wedd.).

118. *Cinchona* hybrid, *officinalis* × *succirubra*. Darjeeling, 1870.
119. *Cinchona villosa* (Pavon).
120. *Quinquina à Quinidine*, from Cinquinquera.
121. *Cinchona pubescens*. "Sent into the English market as White Calisaya in 1852." In Paris Exhibition, 1867.
122. *Cinchona Calisaya morada*. 1862.
123. *Cinchona Calisaya*. Spurious. Yields no Quinine. From South America.
124. *Cinchona Chahuarguera*. Rusty Crown Bark, India.
125. *Cinchona officinalis*, var. *Crispa*. Ceylon.
126. *Cinchona Pitayensis*. South America.
127. *Cinchona Calisaya*, var. *Ledgeriana*. Ceylon.
128. *Cinchona pedunculata*.

Cinchona Alkaloids

129. Cinovatannate of Ammonia. J. E. Howard, label. 1864.
130. Kinovatannate of Cinchonine. J. E. Howard, label. 1864.
131. Cinchona Red, from Red Bark.
132. Kinova (bitter). From Heart Wood of Roots of Red Bark Tree. J. E. Howard, 1868.
133. Wax from Cinchona Bark.
134. Kinate of Quinine.
135. Perfume of Quinquina, described in Lambert's "Illustration of the genus *Cinchona*," *page* 94, 1858.
136. *Cinchona Pelletieriana*.
137. Pure Kinovic Acid. D. H. Label.
138. Aricine, cryst. 1854 and 1857.
139. Kinova Tannic Acid from the Heart Wood of Red Bark, 1857.
140. Cerine from Bark, 1864.

Manuscripts

141. Manuscript Book. "Quinine Operations, 1835, and Onwards," in handwriting of J. E. Howard.
142. Manuscript Book. "Laboratory Costs Book, 1864–1868." David Howard.

Printed Book

143. Joseph Jewell. "A Short Sketch of a Long Life." An autobiography in verse. (J. J. was partner of Luke Howard, F.R.S., founder of the firm.) Newbury, 1840.

PHOTOGRAPHS

144. The gathering of Cinchona Bark.
145. Grafting of *Cinchona Ledgeriana* on to a *Cinchona succirubra* stock.
146. Photograph of *Cinchona Calisaya* and *Cinchona Peruviana* growing in the greenhouse of J. E. Howard, F.R.S., at Tottenham, November, 1879.
147. Photograph of *Cinchona Calisaya Anglica*, etc., growing in the greenhouse of J. E. Howard, F.R.S., at Tottenham, November, 1879.
148. Portrait of Luke Howard, F.R.S.
149. Portrait of J. E. Howard, F.R.S. (born 1807; died 1883).

MISCELLANEOUS

150. Fifty Years' Progress in Cinchona Cultivation—
Three Show Cards, indicating the difference in yield between the *Cinchona Calisaya* of 1872, and the *Cinchona Calisaya* (Ledg.) of 1922.
151. 1 lb. bundle of Bark, to illustrate above.

EXHIBITS FROM
THE IMPERIAL INSTITUTE

SPECIMENS OF CINCHONA BARK

152. *Cinchona succirubra*. Bark Quills, from trees just over 5 years old. Uganda.
153. *Cinchona robusta* (?). Bark Quills, from trees 6 years old. Bukalasa Plantation, Uganda.
154. *Cinchona robusta*. Bark Quills. Tanganyika.
155. *Cinchona succirubra*. Bark Quills, Tanganyika.
156. *Cinchona Ledgeriana*. Bark Quills, Tanganyika.
157. *Cinchona* hybrid *(Ledgeriana* × *Cinchona succirubra)*. Bark Quills, Tanganyika.
158. *Cinchona Ledgeriana*. Natural Bark, from trees growing at an elevation of about 3000 feet. Cameroon.
159. *Cinchona Ledgeriana*. Natural Bark, from trees growing at an elevation of about 5000 feet up the Cameroon mountain. Cameroon.
160. *Cinchona Ledgeriana*. Natural Bark, from trees growing at an elevation of about 5000 feet up the Cameroon mountain. Cameroon.
161. *Cinchona* hybrid. Natural Bark, from trees growing at an elevation of over 5000 feet. Cameroon.
162. *Cinchona officinalis* (?). Bark Quills, St. Helena.

163. *Cinchona succirubra* (?). Bark Quills, St. Helena.

164. *Cinchona succirubra*, "Red Bark":—
Branch Bark, Cinchona Plantations, Nilgiris.
Renewed Bark, Cinchona Plantations, Nilgiris.
Mossed Bark, Cinchona Plantations, Nilgiris.
Bark Quills, Cinchona Plantations, Bengal.

165. *Cinchona officinalis*, "Crown Bark":—
Natural Bark, Cinchona Plantations, Nilgiris.
Renewed Bark, Cinchona Plantations, Nilgiris.
Stem Bark, Botanic Gardens, Calcutta.

166. *Cinchona Calisaya*, "Calisaya Bark":—
Stem Bark, Botanic Gardens, Calcutta.

167. *Cinchona succirubra* × *Cinchona Calisaya*, "Hybrid Cinchona" Bark:—
Stem Bark, Botanic Gardens, Calcutta.
Bark Quills, Cinchona Plantations, Bengal.

168. *Cinchona Ledgeriana*, "Ledger Bark":—
Bark Quills, Cinchona Plantations, Bengal.
Root Bark, Cinchona Plantations, Nilgiris.

169. *Cinchona magnifolia* Bark, from the Nilgiris.

STEM SECTIONS

170. *Cinchona succirubra* × *Cinchona Calisaya*, Cinchona Plantations, Nilgiris.

171. *Cinchona Ledgeriana*, Cinchona Plantations, Bengal.

172. *Cinchona Ledgeriana*, Cinchona Plantations, Nilgiris.

ALKALOIDS, ETC.

173. Alkaloids.
Government Cinchona Febrifuge. Mixed Cinchona alkaloids. "This preparation is made from Cinchona Bark grown at the Government Plantations, Darjeeling, and contains all the febrifugal alkaloids which exist naturally in Cinchona Bark." Three tins: $\frac{1}{4}$ lb., $\frac{1}{2}$ lb. and 1 lb.

174. Quinine Tablets ($3\frac{1}{3}$ grains).
Manufactured at the Juvenile Jail, Alipur. 1 bottle.

175. Quinine Tablets (5 grains).
Lahore Central Jail. 1 bottle.

176. Cinchona Febrifuge Tablets ($3\frac{1}{2}$ grains). 1 bottle.

177. Quinine Powders in packets containing 102 (7 grain) powders.
Lahore Central Jail. 2 packets.

EXHIBITS FROM

H.M. SECRETARY OF STATE FOR INDIA

178. Original volume of Official Correspondence, in manuscript (1859–1870), relating to the Expedition of Sir Clements R. Markham to Peru in connection with the Introduction of Cinchona Cultivation into India.

179. Blue Book.

"Copy of Correspondence relating to the Introduction of the Chinchona Plant into India, and to Proceedings connected with its Cultivation, from March, 1852, to March, 1863." Ordered by the House of Commons to be printed 20th March, 1863.

180. Blue Book.

"Copy of further Correspondence relating to the Introduction of the Chinchona Plant into India, and to Proceedings connected with its Cultivation, from April, 1863, to April, 1866." Ordered by the House of Commons to be printed 18th June, 1866.

181. Blue Book.

"Copy of all Correspondence between the Secretary of State for India and the Governor-General, and the Governors of Madras and Bombay, relating to the Cultivation of Chinchona Plants, from April, 1866, to April, 1870." Ordered by the House of Commons to be printed 9th August, 1870.

182. Blue Book.

"Copies of the Chinchona Correspondence (in continuation of Return of 1870) from August, 1870, to July, 1875." Ordered by the House of Commons to be printed 21st March, 1876.

183. Blue Book.

"Copies of the Chinchona Correspondence (in continuation of Return of 1870) from August, 1870, to July, 1875." Ordered by the House of Commons to be printed 21st June, 1877.

EXHIBITS FROM THE

LINNEAN SOCIETY

PRINTED BOOKS

184. Weddell, H. A. "Histoire Naturelle des Quinquinas." Paris, 1849.

185. Markham, C. R. "The Chinchona Species of New Granada." 1867.

EXHIBIT FROM THE MEDICAL RESEARCH COUNCIL, LONDON

186. "Clinical Comparisons of Quinine and Quinidine." 1925.

EXHIBITS FROM THE MEDICAL SOCIETY OF LONDON

PRINTED BOOKS

187. Chifletius, J. J.
"Pulvis Febrifugus orbis Americani ventilatus, ratione, experimentia et auctoritate." Louvain, 1653.

188. Sturmius, R.
"Corticis China Chinæ," descriptio, 2 parts, 1681.

189. Cogrossus, C. F.
"Della natura, effetti ed uso della Corteccia del Peru ossia Chinachina, considerazioni fisico-mecaniche e mediche." Cremæ, 1711.

190. Lursenius, P. S.
"De Cortice Peruviano." Lugd. Bat. 1751.

191. Petersen, J. C. P.
"De Cortice Peruviano." Upsaliæ, 1758.

EXHIBITS FROM SEÑOR DON C. A. MACKEHENIE, CONSUL-GENERAL OF PERU, LONDON

192. The National Flag of Peru.
193. Map of Peru.
194. Coat of Arms of Peru.

EXHIBITS FROM THE PHARMACEUTICAL INSTITUTE OF THE UNIVERSITY OF BERNE

FRAMED HERBARIUM SHEETS

195. *Cinchona lancifolia*, var. *Karsten*. Seeds sent by H. Karsten. Cultivated in Java. (J. E. Howard.)

196. *Cinchona officinalis*, var. *angustifolia*. Seeds sent from Madras. Cultivated in Java. (J. E. Howard.)

197. *Cinchona succirubra* (Pavon). Hairy-leaved variety. Cultivated in Java. (J. E. Howard.)

198. *Cinchona Pahudiana.* Seeds collected by J. K. Hasskarl. Cultivated in Java. (J. E. Howard.)

Flückiger Herbarium Sheets

Cinchonas from the Plantations in Ootacamund (Malabar Coast). Ex. Herb., W. G. MacIvor, 1877 :—

199. *Cinchona succirubra :* light-pink flowered variety, cultivated Nilgiris, 1877.

200. *Cinchona succirubra :* woolly-leaved variety, cultivated Nilgiris, 1877.

201. *Cinchona officinalis :* variety *Uritusinga*, cultivated Nilgiris, 1877.

202. *Cinchona officinalis :* strong-growing variety, cultivated Nilgiris, 1877.

203. *Cinchona officinalis :* cultivated Nilgiris, 1877.

204. *Cinchona officinalis :* intermediate variety, cultivated Nilgiris, 1877.

205. *Cinchona officinalis :* narrow-leaved variety, cultivated Nilgiris, 1877.

206. *Cinchona officinalis :* resembles *Uritusinga*, cultivated Nilgiris, 1877. Bark contains no quinine.

207. *Cinchona officinalis angustifolia :* contains 12 per cent. quinine ; cultivated Nilgiris.

208. *Cinchona angustifolia conotance :* contains 12 per cent. quinine ; cultivated Nilgiris.

209. *Cinchona*, Hybrid variety : contains 9 per cent. quinine ; cultivated Nilgiris, 1877.

210. *Cinchona*, Hybrid variety : crown bark ; cultivated Nilgiris, 1877.

211. *Cinchona*, Hybrid variety : crossed between *Cinchona succirubra* and *Cinchona Calisaya ;* cultivated Nilgiris, 1877.

212. *Cinchona pubescens* (Howard) : cultivated Nilgiris.

213. *Cinchona*, Hybrid variety : crossed between *Cinchona angustifolia* and *Cinchona pubescens ;* cultivated Nilgiris, 1877.

214. *Cinchona*, Hybrid variety : crossed between *Cinchona succirubra* and *Cinchona officinalis ;* cultivated Nilgiris, 1877. Contains 10 per cent. alkaloids.

215. *Cinchona*, Hybrid : crossed between *Cinchona Calisaya* and *Cinchona angustifolia ;* cultivated Nilgiris, 1877.

216. *Cinchona*, Hybrid : crossed between *Cinchona Calisaya* and *Cinchona micrantha ;* cultivated Nilgiris, 1877.

217. *Cinchona Calisaya :* from Java ; cultivated Nilgiris.

218. *Cinchona Calisaya :* from Peruvian seeds ; cultivated Nilgiris.

219. *Cinchona Pahudiana :* from Java ; cultivated Nilgiris.

220. *Cinchona, sp.:* corky bark; cultivated Nilgiris, 1877.

Collected in the year 1885, in the plantations of the Mapiri district by Dr. Louis Schäfer, afterwards chemist in the Waldhof factory, near Mannheim :—

221. *Cinchona cordifolia* (Mutis [?]). Tree grown from Venezuelan seeds, not yet in bloom. von Gorkom, 1874.

222. *Cinchona Ledgeriana* (Moëns). Lembang, Java, 1890. Height above sea-level 1300 m., above Bandong, on the Tankuban Prahu, Preanger Regency.

223. *Cinchona Ledgeriana.* Plantation of Lembang, Java, 1890. Height above sea-level 1300 m., above Bandong, on the Tankuban Prahu.

224. *Cinchona Ledgeriana.* Plantation of Lembang, Java. 1300 m. above sea-level, on the Tankuban Prahu, above Bandong, Preanger Regency, 1890.

225. *Cinchona Ledgeriana* (Moëns). Lembang, Java, 1890. Height above sea-level 1300 m., above Bandong, on the Tankuban Prahu.

226. *Cinchona purpurea* (Ruiz and Pavon). Purple-red Cinchona tree, Hohenack. Medical and commercial plants, No. 349.

227. *Cinchona purpurea* (Ruiz and Pavon). Purple-red Cinchona tree, Hohenack. Medical and commercial plants, No. 349.

228. *Cinchona succirubra* (Pavon), *angl. fl. albo.* Five years' old tree, grown from British-Indian seeds. Tjiujiruan Plantation. von Gorkom, 1874.

MISCELLANEOUS

229. Seron for South American Cinchona Bark, as used in the middle of the 19th century.

230. China *regia plana*, partly covered: bark of the stem of thick trees, 1865. Probably of *Cinchona Calisaya.*

231. China *regia plana*, with conchas; in commerce, 1865. Probably of *Cinchona Calisaya.*

232. China *rubra dura*, such as was in the trade during the middle of the 19th century.

EXHIBITS FROM THE PHARMACEUTICAL SOCIETY OF GREAT BRITAIN

CINCHONA PLANT SPECIMENS

233. *Cinchona Calisaya* a. *vera.*

Cultivated at Lords Meadows, Tottenham, 1884.

234. *Cinchona Ledgeriana* (Moëns).

Cultivated at Lords Meadows, Tottenham, 1884.

235. *Cinchona Ledgeriana*, or *rojo*.

With MS. note by J. E. Howard, dated 10th August, 1883. "Grown from seeds bought from Ledger in 1866. The true Ledgeriana or rojo, identified by Mr. Ledger in August, 1883. No. 10 of my Herbarium from M. Moëns, *q.v.* in 'Quinology,' *page* 59. From collection of John Eliot Howard."

236. *Cinchona Ledgeriana*.

From Java, with MS. note by Howard. "See 'Quinology,' Plate V—not Ledger's rojo."

237. *Cinchona Pahudiana*.

Howard. From Tjibodas, Java. Specimen from J. E. Howard's Herbarium.

238. *Cinchona Pahudiana*.

Grown in Java, 1874. From J. E. Howard's Herbarium.

239. *Cinchona Hasskarliana*.

Cultivated in Java, 1874. Howard specimen.

240. *Cinchona officinalis* (Linnæus), var. *Bonpland*.

Specimen from J. E. Howard's Herbarium.

241. *Cinchona micrantha* (Pavon).

Cultivated in Java, 1874. Howard specimen.

242. *Cinchona* hybrid, between *Cinchona Calisaya* and *Cinchona succirubra*.

Cultivated in Java, 1874. Howard specimen.

243. *Cinchona Calisaya* (Wedd.).

Cultivated Neddivattan, Nilgiris; ex collection Surgeon-Major G. Bidie, M.B., 1882.

244. *Cinchona succirubra*.

Cultivated Neddivattan, Nilgiris; ex collection Surgeon-Major G. Bidie, M.B., 1882.

245. *Cinchona officinalis Uritusinga* (Pavon). Type.

Cultivated Dodabetta, Nilgiris; ex collection Surgeon-Major G. Bidie, M.B., 1882.

246. *Cinchona pubescens*.

Cultivated Neddivattan, Nilgiris; ex collection Surgeon-Major G. Bidie, M.B., 1882.

247. *Cinchona Ledgeriana*.

(*a*) Cultivated at Mangpoo; (*b*) cultivated at Darjeeling. Both from collection of Dr. G. King, 1883.

248. *Cinchona officinalis.*

Cultivated at Mangpoo; ex collection Dr. G. King, 1883.

249. *Cinchona succirubra.*

Cultivated at Mangpoo; ex collection Dr. G. King, 1883.

Specimens of Cinchona Barks

[Note.—A number of these Specimens were presented by John Eliot Howard to the Royal College of Physicians in 1854, and given by them, in 1924, to the Pharmaceutical Society of Great Britain.]

250. *Cinchona amygdalifolia*, of Bolivia.

From J. E. Howard, 1873.

251. *Cinchona amygdalifolia*, of Peru.

From J. E. Howard, 1873. Very fibrous and poor bark.

252. *Cinchona Calisaya*, of South America.

From David Howard. Howard's letter enclosed in jar.

253. *Cinchona Calisaya.*

From J. E. Howard, through Royal College of Physicians, 1924.

254. *Cinchona Calisaya*, grown in Java.

From Java Department, Paris Exhibition, 1878.

255. *Cinchona Calisaya*, of Rungbee, Darjeeling.

From Dr. Geo. King, Royal Botanic Gardens, Calcutta, 1882. Root Bark. From two *Cinchona Calisaya (Ledgeriana)* trees planted at Rungbee, Darjeeling, at an elevation of 2500 ft., in January, 1868. Bark collected June, 1882.

257. *Cinchona cordifolia.*

From H. von Bergen, through Pereira. China *Flava dura*, of Bergen.

258. *Cinchona elliptica.*

From J. E. Howard, 1873.

259. *Cinchona erythrantha*, of Ceylon.

From J. E. Howard. Copy of Analysis enclosed in jar.

260. *Cinchona Hasskarliana.*

From Amsterdam sales, 14th March, 1872.

261. *Cinchona* hybrid *(Ledgeriana* × *succirubra).*

From Amani, 10th August, 1921. Presented by Dr. A. Leechman.

262. *Cinchona lanceolata*, of Ecuador.

From J. E. Howard, 1873, through Royal College of Physicians, London, 1924. v. Plate 13, Delondre and Bouchardat, contains Quinine and Quinidine.

263. *Cinchona lancifolia*.

From J. E. Howard, December, 1856. The true "Naranjada" or orange bark. Observe the marks of twining plants or creepers.

264. *Cinchona Ledgeriana*, of Java.

From Dr. W. Burck. Samples of Natural and Renewed Barks.

265. *Cinchona Ledgeriana*, of Java.

Section of Trunk showing Bark.

266. *Cinchona macrocalyx*.

From J. E. Howard, 1873. *Cinchona Palton* (Pavon). Cascarilla con Hojas de Palton, Carthagena Bark, from Howard's "Illustration of the Neuva Quinologia of Pavon."

267. *Cinchona micrantha*.

From the Colonial and Indian Exhibition, 1886.

268. *Cinchona mutisii*, of Bolivia.

From J. E. Howard, through Royal College of Physicians, London, 1924.

269. *Cinchona officinalis*, of Dodabetta, Nilgiris.

From the Madras Museum Herbarium, 1883.

270. *Cinchona officinalis*, of Ecuador.

From J. E. Howard, through Royal College of Physicians, London, 1924.

272. *Cinchona officinalis*, of Dodabetta, Nilgiris.

From the Madras Museum Herbarium, 1883. The bark belonging to this specimen is renewed after the tree had been subjected to the Java shaving process.

273. *Cinchona officinalis*, var. *Condaminea*, of Ecuador.

From J. E. Howard, through Royal College of Physicians, London, 1924.

274. *Cinchona officinalis*, var. *Condaminea*, of Neddivattan, Nilgiris.

From the Madras Museum Herbarium, 1883. This is the *Cinchona Condaminea* type of Howard.

275. *Cinchona officinalis*, var. *Uritusinga*, of Ecuador.

From J. E. Howard, through Royal College of Physicians, London, 1924.

277. *Cinchona officinalis.*

From the Colonial and Indian Exhibition, 1886.

278. *Cinchona officinalis*, var. *angustifolia.*

From the Madras Museum Herbarium, 1883.

279. *Cinchona officinalis*, of India, Rungbee, Darjeeling.

From Dr. Geo. King.

280. *Cinchona ovata* (Weddell), of Peru.

From J. E. Howard, through Royal College of Physicians, London, 1924.

281. *Cinchona Peruviana.*

From J. E. Howard. Authentic specimen from Prichett, 1860.

282. *Cinchona Pitayensis*, of Dodabetta, Nilgiris.

From the Madras Museum Herbarium, 1883.

283. *Cinchona pubescens*, of Peru.

From J. E. Howard, through Royal College of Physicians, London, 1924. *Cinchona pubescens*, var. *Pelletieriana* contains Aricine.

284. *Cinchona pubescens*, of Neddivattan, Nilgiris.

From the Madras Museum Herbarium, 1883. (*See Plant Specimen.*)

285. *Cinchona scrobiculata.*

From J. E. Howard, March, 1852. *Cinchona Colorada* de Santa Ana. Yields abundance of cinchonine, but little or no quinine.

286. *Cinchona scrobiculata.*

From Messrs. Godfrey & Cooke, through Daniel Hanbury, 1854.

287. *Cinchona suberosa*, from the Woods of Chicoplaya.

From J. E. Howard, 1873. The Parecida a la Naranjada of Pavon, discovered by Tafalla in the Woods of Chicoplaya.

288. *Cinchona succirubra.*

From J. E. Howard, 1873. Grown in shade.

289. *Cinchona succirubra.*

From J. E. Howard, 1873. Grown in sunshine.

290. *Cinchona succirubra*, of Uganda, per E. Goulding.

From the Imperial Institute, May, 1927.

291. *Cinchona succirubra*, of Jamaica.

From Prof. H. G. Greenish, 1893.

292. *Cinchona succirubra*, of Ormidah Estate, Maskelyia, Ceylon.
From James G. Macfarline, May, 1883. Obtained from tree 8 years old.

293. *Cinchona succirubra*, of Nilgiris.
From the India Museum, London, 1880. Obtained from plants $4\frac{1}{2}$ years old.

294. *Cinchona succirubra*.
From Messrs. Southall & Co., Birmingham, 1874. Analysed by Dr. de Vrij.

295. *Cinchona succirubra*, of India, Rungbee, Darjeeling.
From Dr. Geo. King, of Royal Botanic Gardens, Calcutta. Tree planted at Rungbee, Darjeeling, elevation 3000 ft., in June, 1868. Bark collected in June, 1882.

296. *Cinchona, sp.*, of Neddivattan, Nilgiris.
From the Madras Museum Herbarium, 1883. Pata de Gallinazo of Cross.

QUININE ALKALOIDS, ETC.—ORIGINAL SPECIMENS

297. Quinia (Quinine). From F. Farries, May, 1880.
298. Quiniæ Acetas. From Howard, 1851.
299. Quiniæ Bibromidum. From Morson & Son, 1878.
300. Quinidiæ Bibromidum. From A. Petit, 1878.
301. Quiniæ Citras.* From Howard, 1851.
302. Quiniæ Disulphas.* From Howard, 1851.
303. Quiniæ Hydras. From Howard, 1851.
304. Quinidiæ Hydrobromas. From A. Petit, 1878.
305. Quiniæ Kinas.
306. Quiniæ Murias.* From Howard, 1851.
307. Quiniæ Phosphas.* From Howard, 1851.
308. Quiniæ Sulphas Acida.* From Howard, 1851.
309. Quiniæ Sulphas Acida.* From Howard, 1851.
310. Quiniæ Tartras.* From Howard, 1851.
311. Quinidiæ Sulphas.* From Howard, 1851.
312. Quinoidia.* From Howard, 1851.
313. Quinidine.
314. Quinoidine.

* These Specimens were exhibited at the Great Exhibition of 1851

MANUSCRIPT LETTERS

[FROM DANIEL HANBURY TO DR. J. E. DE VRIJ]

	Date	*Contents*
315.	28th September, 1853 ...	Forwarding quantity of Carthagena Bark, from Howard's, for analysis.
316.	9th June, 1855	Regarding cultivation of Cinchona in India. (See also note by de Vrij on the historical interest of this letter, which led to Howard manufacturing Quinidine in 1857).
317.	7th February, 1856 ...	Sending Howard's samples of Cinchona Alkaloids.
318.	27th September, 1856 ...	Referring to Dr. Stenhouse's work on Cinchona Alkaloids.
319.	9th January, 1857 ...	Sending corrected proof of de Vrij's article on Quinidine, with comments on the experiments of Pasteur.
320.	16th January, 1857 ...	Regarding additional alterations to de Vrij's article.
321.	18th March, 1859 ...	Informing de Vrij of Howard's work on a series of coloured plates of Cinchona species (published in 1862 as "Illustrations of the Nueva Quinologia").
322.	20th June, 1859... ...	Announcing publication of first two parts of Howard's book. Also informing de Vrij of the British Government's decision to introduce the cultivation of Cinchona into India.
323.	13th September, 1859 ...	Acknowledging de Vrij's specimens of Cinchona from Java.
324.	24th February, 1860 ...	Suggesting exchange of Cinchona Seeds between Indian Government and Java authorities.
325.	15th August, 1860 ...	On Markham's return from Bolivia with 276 living Cinchona plants for India.
326.	9th February, 1862 ...	Regarding display of de Vrij specimens of Cinchona at the Exhibition of 1862, 2nd December, 1862. Details regarding *Cinchona Pahudiana*.
327.	9th March, 1863 ...	Concerning a passage in Markham's report which de Vrij thought to be offensive.
328.	17th February, 1864 ...	A letter of welcome to de Vrij on his return to Europe from Java.*

* De Vrij's reply, dated 20th March, 1864, to this letter is in the collection of The Wellcome Historical Medical Museum.

329. 18th June, 1864 ... The arrival of R. Spruce in London from Peru ; and noting the death of Junghuhn.
330. 17th November, 1864 ... *Re* Hasskarl's book ; and the Darjeeling Cinchona plantations.
331. 13th September, 1866 ... Appointment of Mr. Broughton as Chemist to Indian Cinchona plantations
332. 21st September, 1866 ... *Re* Chemical Researches on Cinchona Alkaloids.
333. 3rd May, 1874 ... ... Flückiger's comments on de Vrij's arguments regarding Quinidine.

PHOTOGRAPHS

334. *Cinchona nitida, vera.*
Grown at Tottenham, London, by J. E. Howard.
335. *Cinchona micrantha.*
Grown at Tottenham, London, by J. E. Howard, 1865.
336. *Cinchona officinalis,* var. *Uritusinga.*
Grown at Tottenham, London, by J. E. Howard.

EXHIBITS FROM THE
ROYAL BOTANIC GARDENS, KEW

CINCHONA PLANT SPECIMENS

337. *Cinchona Ledgeriana.* Ceylon.
338. *Cinchona officinalis.* Darjeeling.
339. *Cinchona officinalis.* Ootacamund.
340. *Cinchona succirubra.* Ootacamund.
341. *Cinchona Calisaya.* Ootacamund.
342. *Cinchona Pahudiana.* Davabetta Plantation, India.
343. *Cinchona Peruviana.* Neddivattan, India.
344. *Cinchona micrantha.* Neddivattan, India.
345. *Cinchona nitida.* Neddivattan, India.
346. *Cinchona pubescens.* (Herb. Hk.).

SPECIMENS OF CINCHONA BARKS

347. *Cinchona officinalis,* var. *Crispa.* Ceylon. 60. 1882. T. J. Buchanan.
348. "Pale" or "Crown Bark," *Cinchona officinalis* (Linn.). Renewed. Indian Museum. Amsterdam Exhibition. 179. 1883.

349. "Crown Bark," *Cinchona officinalis*, var. *Crispa*. From trees 9 years old, Nilgiris. Indian Museum.

350. "Fine Renewed Bark," *Cinchona officinalis* (Linn.). Madras. 60. 1882. T. J. Buchanan.

351. *Cinchona officinalis*, var. *Crispa*. Original bark, unmossed. J. E. Howard.

Analysis :—

Crystallised sulphates	0·259
Alkaloids soluble in ether, chiefly quinine ...	0·370
Insoluble in ether, cinchonine or trace	—
	0·629

352. *Cinchona Peruviana* (Howard). Contains much cinchonine, which crystallises easily and well. J. E. Howard.

353. "Natural Branch Crown Bark," *Cinchona officinalis* (Linn.). Madras.

354. Jaen Bark, *Cinchona Humboldtiana* (Lamb). Peru, 1878. J. E. Howard.

355. Pitaya Bark (natural), *Cinchona Pahudiana* (Howard). India. 179. 1883. Amsterdam Exhibition.

356. "Quina Naranjada," Caqueta Bark of Commerce, *Cinchona lancifolia* (Mutis). J. E. Howard.

357. Fine Carthagena Bark, *Cinchona officinalis* (Linn.). 1877. C. Chantre.

358. "Spurious Calisaya Bark," *Cinchona Australis* (Weddell). South Bolivia. J. E. Howard.

359. Orange Bark of "Mutis," Caqueta River Bark, *Cinchona lancifolia* (Mutis). Colombia. J. E. Howard.

360. Quina Roja Fibrosa, *Cinchona Pitayensis* (Weddell). Jarumal, Antioquia. W. R. Jervis.

361. "Grey Bark," *Cinchona nitida* (R. and P.). Huanuco.

362. Cinchona Bark, *Cinchona nitida* (Bth.). Cundinamarca, Colombia. 46. 1916. M. T. Dawe.

363. Mossed Bark of *Cinchona cordifolia* (Mutis). India. 179. 1883. Amsterdam Exhibition.

364. *Cinchona pubescens* (Vahl). J. E. Howard.

365. Bark of *Cinchona officinalis* (Linn.). Grown in St. Helena. 152. 1883. Sir D. Morris.

366. "Pale" or "Crown Bark," *Cinchona officinalis* (Linn.). Natural. Neddivattan, India. 179. 1883. Indian Museum. Amsterdam Exhibition.

367. Bark of *Cinchona Calisaya* (Weddell). Java. 60. 1882. T. J. Buchanan.

368. Stem Bark of *Cinchona micrantha* (R. and P.), probably a glabrate form of *Cinchona succirubra* (Pav.). Jamaica. 27. 1883. Sir D. Morris.

369. "Grey Bark," *Cinchona micrantha* (R. and P.). From trees 10 years old. Nilgiris. India Museum.

370. "Brown Bark," *Cinchona ovata* (R. and P.). Peru. J. E. Howard.

371. Trunk Bark of *Cinchona Calisaya* (Weddell). From a tree 5 or 6 years old. Jamaica. 27. 1883. Sir D. Morris.

372. *Cinchona succirubra* (Pav.). Grown at St. Thomas, West Africa. 21. 1884. Messrs. T. Cristy & Co.

373. "Red Bark," *Cinchona succirubra* (Pav.). Jamaica, 1881. T. Whiffin.

374. "Quinquina jaune," "Royal" or "Yellow Cinchona Bark," *Cinchona Calisaya* (Weddell). Messrs. Drew & Co.

375. Grey Bark (Natural), *Cinchona micrantha* (R. and P.). India. 179. 1883.

376. *Cinchona succirubra* (Pav.), Java. 60. 1882. T. J. Buchanan,

377. *Cinchona succirubra* (Pav.), Burma. 179. 1883. Amsterdam Exhibition.

378. Rose d'Ocaña, *Cinchona rosulenta* (Howard). 1878. J. E. Howard.

379. Unmossed Yellow Bark, *Cinchona Calisaya* (Weddell), Madras. India Museum.

380. Bark of *Cinchona robusta* (Howard), Tanganyika. 66. 1924. British Empire Exhibition, Wembley.

381. Grey Bark, *Cinchona micrantha* (R. and P.), Government Cinchona Plantations, Darjeeling. India Museum.

382. Mossed Bark of *Cinchona succirubra* (Pav.). From trees 10 years old. Nilgiris. India Museum.

383. Maracaibo Bark, *Cinchona tucujensis* (Karst). Venezuela, 1878. J. E. Howard.

384. Carabaya Bark, *Cinchona elliptica* (Weddell). Peru, 1878. J. E. Howard.

385. Crown Bark, *Cinchona officinalis*, Government Cinchona Plantations, Darjeeling. Indian Museum.

386. "Yellow Peruvian Bark," "Monopoly," *Cinchona Calisaya* (Weddell). South America. Messrs. A. S. Hill & Son.

387. *Cinchona ovata*, var. *macrocarpa*. 1878. J. E. Howard.

388. *Cinchona Pahudiana* (Howard). Government Cinchona Plantations, Darjeeling. Indian Museum.

389. *Cinchona Ledgeriana* (Moëns). Botanical Department, Jamaica. 166. 1896.

390. Very rich cultivated *Cinchona Calisaya* (Weddell). Bolivia. 60. 1882. T. J. Buchanan.

391. Bark of *Cinchona Ledgeriana* (Moëns), Tanganyika. 66. 1924. British Empire Exhibition, Wembley.

392. *Cinchona Ledgeriana* (Moëns). Planted at Rungbee, Darjeeling, at an elevation of 2500 feet, January, 1868; bark collected in June, 1882. 171. 1882. Sir G. King.

393. Branch Bark of *Cinchona succirubra* (Pav.). Grown in St. Helena. 152. 1883. Sir D. Morris.

394. Twig Bark of *Cinchona Calisaya* (Weddell). From a tree 5 or 6 years old. Jamaica. 27. 1883. Sir D. Morris.

395. Root Bark of *Cinchona officinalis* (Linn.). From a tree about 9 years old, growing at an elevation of 5500 feet. Jamaica. 27. 1883. Sir D. Morris.
396. *Cinchona pubescens*, var. *Pelletieriana*. J. E. Howard.
397. Twig Bark of *Cinchona officinalis* (Linn.). From a tree about 9 years old, growing at an elevation of 5500 feet. Jamaica. 27. 1883. Sir D. Morris.
398. Powder of Red Bark, *Cinchona succirubra* (Pav.), Government Central Museum, Madras.
399. *Cinchona Calisaya* (Weddell), Government Cinchona Plantations, Darjeeling. India Museum.
400. *Cinchona Calisaya*, var. *Morado*. Bolivia and Peru. Messrs. Hodgkinson.
401. Ordinary Cinchona Febrifuge obtained from *Cinchona succirubra* (Pav.), Calcutta, 171. 1882. Sir G. King.
402. Quina Amarilla or China Flava, *Cinchona cordifolia*, var. *vera*. Colombia. F. W. Birschel.
403. "Loxa" or "Crown Bark," *Cinchona officinalis* (Linn.). Messrs. Drew & Co.
404. Bark of *Cinchona succirubra* (Pav.). Fiji. 80. 1886. Colonial and India Exhibition.
405. Root Bark of *Cinchona Ledgeriana* (Moëns), India. 5. 1908. Franco-British Exhibition, 1908.
406. "Loxa Bark," *Cinchona officinalis* (Linn.). Bogota, Colombia. 60. 1882. T. J. Buchanan.
407. Branch Bark of *Cinchona succirubra* and *Cinchona officinalis*, India. 5. 1909. Franco-British Exhibition.
408. Bark of *Cinchona officinalis* (Linn.), var. *Bonplandiana*, $2\frac{1}{2}$ years old, growing at an elevation of 3500 ft. Darjeeling. 1869. Dr. Anderson.
409. Bark of *Cinchona succirubra* (Pav.). From a tree 20 feet high. Forests of Chimborazo. 1861. R. Spence.

PHOTOGRAPHS

ILLUSTRATING THE CULTIVATION OF CINCHONA AND THE PRODUCTION OF QUININE

410. General View of Interior of Quinine Extraction Factory at Mangpoo.
411. View in Purifying House.
412. View in Purifying House, showing tilting pots and crude quinine crystallising troughs.
413. View in Quinine Purifying House, showing crystallising troughs for the purified quinine.
414. Disintegrator, with top half removed to show the disc with two of the beaters.
415. View in Grinding House, showing platform and one disintegrator with feeding bin—the latter empty.

416. Collecting Seed Capsules of *Cinchona Ledgeriana* on Munsong Plantation.

417. Cinchona Bark-drying Sheds.

418. Coolies collecting Cinchona Bark, Munsong Plantation.

419. Removing Cinchona Bark for analysis from a selected tree, Munsong Plantation.

420. *Cinchona succirubra* trees on Munsong Plantation.

421. A ridge covered with *Cinchona Ledgeriana*, at Munsong.

422. Transplanting Cinchona Seedlings, Munsong Plantation.

423. Young Plants of *Cinchona Ledgeriana*, on a Nursery Line at Munsong.

424. Sowing Cinchona Seed, in a Nursery Bed, Munsong Plantation.

425. A Cinchona Nursery, on Munsong Plantation.

MISCELLANEOUS

426. Packet of Quinine, as sold in Post Offices in India.

427. Bust of Candolle.

427A. Bust of Jussieu.

EXHIBITS FROM THE
ROYAL BOTANIC SOCIETY OF LONDON

428. Quinoidine, "a resinous substance obtained from the mother liquor from which sulphate of Quinine has been crystallized; described by Liebig in 1846 as Amorphous Quinine."

429. Jungbuhn (*sic*) Fr., and De Vrij, J. E. "An Account of the Quinquina Plantations in the Island of Java." Madras, 1861.

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432. Bergen, H. von. "Versuch einer Monographie der China." Hamburg, 1826.

EXHIBITS FROM THE
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433. Sir Clements R. Markham, F.R.S., Portrait of, by George Henry, A.R.A.

Born at Stillingfleet, Yorks, 1830. Entered Navy, 1844. Travelled in Peru, 1852-53. Entered Civil Service, 1853. India Office, 1858. Charged with collection of Cinchona Trees in Eastern Andes and acclimatisation in India, 1860. Secretary of Royal Geographical Society, 1863–88. President, 1893. Died, 1916.

434. Map of America in 1648, by Joannes Blaeu, being four sections, in facsimile, of his Map of the World; believed to be a revised issue of an earlier map.

EXHIBIT FROM THE
ROYAL SOCIETY

435. Sir Joseph Dalton Hooker, O.M., F.R.S., Portrait of, by Hon. John Collier, R.A.

President of the Royal Society, 1873. As Director of the Royal Botanic Gardens, Kew, he played an important advisory part in the cultivation of Cinchona in India, and the manufacture of both quinine and the febrifuge in that country.

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SOCIÉTÉ DU TRAITEMENT DES QUINQUINAS, PARIS

444. Caventou, Joseph B.
Bronze plaque executed by M. Cormier, after the statue by Lormier.

445. Pelletier, Pierre Joseph.
Bronze plaque executed by M. Cormier, after the statue by Lormier.

445A. La Condamine's Manuscript Memoir, published in the Académie Royale des Sciences, 1738. Photograph of.

445B. De Jussieu's Voyage to South America. Photograph of Memorandum relating to.

EXHIBITS FROM THE
SOCIETY OF APOTHECARIES OF LONDON

446. Herbarium Officinale—Societatis Pharmaceuticæ. Tomus III, 1770.

447. Portrait of Nathaniel Bagshaw Ward, F.R.S., F.L.S.
Master of the Society of Apothecaries, 1854. Designer of the Wardian Containers in which Markham brought the living Cinchona Plants from Central America to India.

448. Plan of Chelsea Physic Garden. Engraving by Sutton Nicholls, 1725.

449. Plan of Chelsea Physic Garden. Engraving by B. Cole, 1732.
John Evelyn, in his Diary for 7th August, 1685, refers to the Cinchona Plants at Chelsea Physic Garden. He says: "I went to see Mr. Watts, Keeper of the Apothecaries' Garden of Simples at Chelsea, where there is a collection of innumerable rarities of that sort particularly, besides many rare annuals, the tree bearing Jesuits' bark, which had done such wonders in quartan agues . . . "

450. Water-colour Drawing of the Grinding Mill of the Society of Apothecaries, 1788.

451. Copper Tablet recording "Stone laid by ye hands of Sr. Hans Sloane, Donor of this Garden . . . ." etc.

EXHIBITS FROM

PROFESSOR A. TSCHIRCH

(OF THE PHARMACEUTICAL INSTITUTE OF THE UNIVERSITY OF BERNE)

PHOTOGRAPHS, DIAGRAMS, ETC.

452. *Cinchona Ledgeriana* in the Government Cinchona Enterprise in Java.
453. *Cinchona succirubra* in the Cinchona Plantation, Lembang, in Java, 1889.
454. *Cinchona robusta* in the Government Cinchona Enterprise, in Java.
455. *Cinchona Calisaya*, var. *Ledgeriana*.
456. *Cinchona Ledgeriana*. From specimens from Java.
457. *Cinchona succirubra*.
458. *Cortex cinchonæ* (Anatomy).
459. Geographical distribution of officinal Cinchonas in South America. *After* Rössig.
460. The Cinchona Bark districts of South America, and their port of export. Tschirch, Handbook.
461. Cinchona Plantation, Ootacamund. Renewed bark.
462. *Cinchona succirubra* (Pavon), cultivated in avenues.
463. *Cinchona, sp.* Tuin, in Java.
464. Finished Cinchona Bales, manufactured by means of hydraulic press.
465. American Cinchona Bark in a London warehouse.
466. The Cinchona establishment in Amsterdam.
467. Cinchona Plantation, Preanger Regency, Java.
468. Kampong, alongside a Cinchona Plantation, Java.
469. Photographs of the Cinchona Plantation, Lembang, in Central Java. Original photographs by Prof. A. Tschirch, 1888.
470. General view over the Tankuban Prahu and the Cinchona districts.
471. Plantation of *Cinchona Ledgeriana*. In foreground a nursery for seedlings of *Cinchona succirubra*.
472. Nursery for seedlings of *Cinchona succirubra* in Lembang.
473. Cinchona Plantation *(Cinchona succirubra)*.
474. Cinchona Plantation, Kinatuin, in Lembang. *Cinchona succirubra* (partly renewed).
475. *Cinchona succirubra*. Grown-up Cinchona tree in Lembang.
476. *Cinchona succirubra*. Peeled off in strips for the purpose of renewing the bark.
477. Picking the Cinchona Bark in the Cinchona Plantation in Lembang.
478. Peeling, sorting, pressing and packing *Cinchona succirubra* bark in the plantation of Lembang, Central Java.

PORTRAITS

479. The International Botanical Congress in Amsterdam, 1877. Section on Cinchona bark.

Standing: Jul. Jobst, G. Kerner, H. A. Weddell, Gust. Planchon, A. J. Rijk.

Seated in Front: Ph. Phœbus, J. E. de Vrij, J. E. Howard, J. K. Hasskarl.

480. P. J. Pelletier and J. B. Caventou, the discoverers of quinine.

481. Monument of Pelletier (right), and Caventou (left) at Paris, unveiled in 1900. Taken in the studio of the artist.

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Special reprint from the "Real-Encyclopädie der Gesammten Pharmacie" ("Real Encyclopædia of Complete Pharmacy"), 1887.

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With a double plate. Special reprint from the "Schweizerische Wochenschrift für Chemie und Pharmacie" ("Swiss Weekly for Chemistry and Pharmacy"), 1900.

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486. Owen, T. C., "Cinchona Planters' Manual," Colombo, 1881.

EXHIBITS FROM

PROFESSOR P. VAN DER WIELEN

LABORATORIUM VOOR ARTENSIJBEREIDKUNDE DER UNIVERSITEIT VAN AMSTERDAM

PHOTOGRAPHS

487. Group of Jury Cinchonologique du Congrès International Botanique, Amsterdam, April, 1877.

Standing (left to right): Jul. Jobst, G. Kerner, H. A. Weddell, Gust. Planchon, A. J. Rijk. *Seated*: Ph. Phœbus, J. E. de Vrij, J. E. Howard, J. K. Hasskarl.

488. Blume, Dr. Carl L.

Born, Braunschweig, 1798; died 1862. Educated University of Leyden. Sent on botanical research to Batavia, 1818. Professor of Botany, Leyden, 1827. Wrote on Plants of India and Java, in *Thesaur. litt. Botanicæ*, "Floræ Javæ," 1828. Urged Dutch Government to introduce Cinchona into Java.

489. de Vrij, Dr. J. E.

Born 1831. Studied pharmacy under Liebig. Joined Junghuhn, in 1857, as one of the Expedition to Dutch East Indies for the introduction of Cinchona cultivation.

490. van Gorkom, K. W.

First planter of Cinchona in Java.

491. Junghuhn, F. W., outside his dwelling in Java.

492. Teysmann, J. E.

At Tjibodas cultivated the first Cinchona Plants brought from South America to Java in 1855.

493. van Leersum, P.

At one time Director of the Cinchona Plantations in Java.

494. Hasskarl, J. K.

Born at Cassel, 1811. Inspector of Garden of Plants, Düsseldorf, 1832–34. Under the name of Dr. Karl Muller, brought the first Cinchona plants direct from South America to Dutch East Indies. Set out for Java, 1836. Attached to Botanical Gardens at Buitenzorg, Batavia. "Over Het nut van de planten Javas," 1844. "Plantæ Javanicæ," 1847.

495. Caventou, Joseph B.

Born Saint-Omer, 1795. Professor at School of Pharmacy, Paris. Caventou, with Pelletier, in 1827, received the Montyon prize of Fr. 10,000 from the Institut de France for their discovery, in 1820, of the two Cinchona alkaloids, Quinine and Cinchonine.

496. Pelletier, Pierre Joseph.

Born Paris, 1788. Died, 1842. Studied pharmacy. Louis XVIII decorated him with the Croix d'Honneur, 1824. Joint Director, School of Pharmacy, Paris, 1832. Member of Académie de Médecine, 1821. "Sur le Quinquina," 1821.

497. "Prins Frederik."

The Ship which took the first consignment of Cinchona Plants to Java.

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EXHIBITS FROM THE
WELLCOME CHEMICAL RESEARCH LABORATORIES

CINCHONA BARKS FROM TANGANYIKA TERRITORY

579. *Cinchona succirubra*, Bark A.
580. *Cinchona succirubra*, Bark B.
581. *Cinchona* hybrid, C.
582. *Cinchona* hybrid, D.
583. *Cinchona* hybrid, E.

The five barks shown are of the following origin :—

A, B } Barks of *Cinchona succirubra*.

C, D, E } Hybrid Barks. *(Cinchona Ledgeriana* × *Cinchona succirubra.)*

The table of analyses shows that these barks are all of normal quality except sample D, which differs from C and E in containing quinine and cinchonidine in about equal proportions, instead of the proportions—quinine 4 or 5 : cinchonidine 1, as found in hybrid barks C and E. The reason for this anomaly appears to be that in the tree yielding sample D, the influence of the *Cinchona succirubra* stock predominated over that of the *Cinchona Ledgeriana* graft.

	Cinchona succirubra		Hybrid Barks		
	A	B	C	D	E
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Moisture	9·0	9·5	9·8	9·8	9·6
Total Alkaloids :					
B.P. 1914 process	7·0	7·9	9·5	10·2	11·3
U.S.P. 1916 process	6·7	5·9	9·9	9·6	11·1
Quinine and Cinchonidine :					
B.P. 1914 process	5·1	5·9	7·5	6·9	8·5
Ether soluble alkaloids :					
U.S.P. 1916 process	5·9	5·4	8·9	8·9	10·8
Quinine	—	—	6·2	3·8	6·5
Cinchonidine	—	—	1·2	3·3	1·7

CINCHONA FEBRIFUGE

584. Cinchona Febrifuge A.

585. Cinchona Febrifuge B.

586. Cinchona Febrifuge C.

This material consists of the alkaloids of cinchona bark left after the removal of the bulk of the quinine by the manufacturer. It is a cheap, anti-malarial drug, largely used in tropical and sub-tropical countries. It varies widely in composition, as is shown by the following table of analyses of the three samples exhibited. Of these, A appears to be a "cinchona febrifuge" with quinine added to it; B is of poor quality; and C alone is typical febrifuge, containing over 50 per cent. of crystallisable alkaloids.

Composition of Febrifuges A, B, C.

	A	B	C
Quinine	15·6	1·8	5·5
Cinchonidine	16·9	1·5	4·7
Quinidine	3·9	4·3	5·4
Residual Alkaloids	48·1	76·3	74·9
Crude cinchonine	—	—	52·8
Crystallisable cinchonine	12·6	11·0	34·6
Crystallisable cinchonine (with correction for solubility)	15·5	17·5	36·2
Quinoidine (by difference)	32·6	58·8	38·4
Ash	10·3	4·5	2·8
Moisture	3·9	7·3	1·8
Organic impurities (by difference)	1·3	4·3	4·9

PURE CINCHONA ALKALOIDS

587. Quinine Acid Sulphate.

588. Quinidine Base.

589. Cinchonine Base.

590. Cinchonidine Base.

591. Hydroquinine Sulphate.

592. Hydroquinidine Sulphate.

593. Hydrocinchonine Sulphate.

594. Hydrocinchonidine Sulphate.

Of the four principal alkaloids found in cinchona bark, quinine is generally accepted as the most valuable, but there have always been

dissentients from that view, and though many attempts have been made to settle the question by clinical trials, the results are still inconclusive. It is possible that more definite results may be obtained by carefully controlled trials in bird malaria. For this purpose the pure specimens shown of the eight most important cinchona alkaloids have been prepared, but only preliminary trials in bird malaria have so far been made, and on the basis of these results they are provisionally arranged in descending order of therapeutic efficiency in the following table :—

Hydroquinine

↓

Quinine, Quinidine, Hydroquinidine

↓

Cinchonidine, Hydrocinchonidine

↓

Cinchonine, Hydrocinchonine

Modified Cinchona Alkaloids—Alkylquitenines

595. Methylquitenine Monohydrochloride.
596. Ethylquitenine Base.
597. *n*-Propylquitenine Monohydrochloride.
598. *iso*-Propylquitenine Monohydrochloride.
599. *n*-Butylquitenine Monohydrochloride.
600. *iso*-Butylquitenine Monohydrochloride.
601. *n*-Amylquitenine Base.
602. *iso*-Amylquitenine Monohydrochloride.
603. Ethylquitenidine.
604. Ethylcinchotenidine.
605. Ethylcinchotenine.
606. *iso*-Amylcinchotenine.
607. General Constitutional Formula for Cinchona Alkaloids.

Perusal of the general formula for cinchona alkaloids exhibited will show that these substances can be altered in various ways without changing the nuclear structure. The resulting substances may be called "modified cinchona alkaloids." Many of these compounds have been made, but so far little has been done to ascertain whether in this way the anti-malarial action of the parent alkaloids can be improved upon. Trials

in bird malaria are now being made with some of these compounds to test this point, and the series of alkylquitenines shown has been made for this purpose. On oxidation, the active alkaloid quinine yields the inactive substance quitenine; the latter is an acid; on esterification, activity is recovered, and as the esterifying radicle is increased in weight, activity increases until at butyl- and amyl-quitenines the compounds become curative for bird malaria.

EXHIBITS FROM THE WELLCOME MUSEUM OF MEDICAL SCIENCE MALARIA SECTION

DESCRIPTIVE TEXT AND LABELS

I.—DISTRIBUTION

608. Map showing distribution.

609. Summary :—

A widespread disease, common in tropical and sub-tropical countries, caused by a non-cellular parasite—a protozoon—of the class *Sporozoa*, of the genus *Plasmodium*.

Three species of parasite have been incriminated—*Plasmodium malariæ*, *Plasmodium vivax* and *Plasmodium falciparum*. These parasites multiply asexually in the human blood and sexually in some mosquito of the genus *Anopheles*, these mosquitoes being essential for transmission from man to man. In the process of asexual development the various parasites present characteristic features by which they can be distinguished, the production of pigment being common to all. The ultimate product of schizogony is the merozoite, which infects fresh corpuscles and starts the cycle again. Eventually certain merozoites, instead of becoming schizonts, develop into gametocytes. The various stages of development both in the mosquito and man are clearly demonstrated in the accompanying illustrations.

Paroxysms of fever are said to coincide with the liberation of merozoites or spores, which thus determines the characteristic feature of the temperature chart. *Plasmodium vivax* causes tertian malaria, with a febrile paroxysm every 48 hours ; *Plasmodium malariæ* causes quartan malaria, with fever every 72 hours ; whilst *Plasmodium falciparum* causes malignant malaria, with an irregular chart.

Clinically, malaria is characterised by attacks of shivering, fever and sweating, accompanied in later stages by anæmia and enlarged spleen. In severe forms, practically any system may be affected, more especially the digestive and nervous. In malarious districts the inhabitants suffer from a chronic form of the disease.

In malaria the spleen and liver are enlarged, there is marked anæmia, blood changes are profound and characteristic, the complexion is sallow ; whilst in malignant malaria the small vessels of the brain or intestine may be blocked with infected corpuscles.

For *treatment*, reliance is placed on quinine and other cinchona products, which may be administered orally, intramuscularly, or intravenously.

Stovarsol has been found to be effective, especially in benign tertian infection. Plasmoquin Compound is of value, more especially against the gametocytes of malignant malaria.

Prevention depends upon supervision of the infected, the suppression of mosquitoes with elimination of breeding-places, and measures taken to safeguard the healthy population, such as mosquito nets or prophylactic quinine.

II.—HISTORY

Twelve Photographs are exhibited of pioneers in malaria work :—

610. Susruta. *Circa* 600 B.C.

Early Indian physician. In his writing, ascribed fevers to bites by mosquitoes.

611. Hippocrates. 460–377 B.C.

Greek physician, commonly known as "the Father of Medicine." Described accurately the clinical features of malaria and other tropical diseases.

612. Celsus. 25 B.C.–A.D. 45.

Roman physician and encyclopædist ; clearly distinguished two forms of malaria, and wrote on leprosy.

613. Galen. A.D. 130–200.

Greek physician and writer. Carefully described quartan and tertian malaria.

614. Morton, Richard. 1699–1730.

British physician and contemporary with Sydenham, with whom he was the first to introduce cinchona in the treatment of febrile conditions in England. Described epidemics of dysentery.

615. Beauperthuy, Louis Daniel. 1807–1871.

French physician. A great worker in the realm of tropical medicine, and one of the earliest advocates of the mosquito transmission theory for yellow fever and malaria.

616. Maillot, F. C. 1804–1894.

French physician and army surgeon. By his prophylactic work enabled the French to retain their hold on Algeria. Distinguished and classified the various tropical and sub-tropical fevers, and carried out much valuable work on the subject of malaria and its transmission.

617. Celli, Angelo. 1857–1914.

Italian physician. Celebrated for his work on tropical medicine, more especially on malaria.

618. Laveran, Charles Louis Alfonse. 1845–1922.

French physician and protozoologist. One of the great pioneers of Tropical Medicine. Professor at the Pasteur Institute, Paris. In 1880, discovered the parasite of malaria. Wrote classical treatises on malaria, leishmaniasis and trypanosomiasis.

619. Grassi. 1854–1925.

Proved that the development of the human malarial parasite in Anopheline mosquitoes followed Ross's cycle for bird malaria, and that these mosquitoes transmitted the disease from man to man.

620. Manson, Sir Patrick. 1844–1922.

Formulated the mosquito malaria hypothesis as a result of his work on filariasis and inspired Ross to put it to the test.

621. Ross, Sir Ronald. 1857–

Demonstrated the development of the parasites of bird malaria in mosquitoes, and their transmission by these insects. Traced the early stages of development of the human parasite in Anopheline mosquitoes and concluded that they would transmit.

622. Coloured Drawing of hut, where classical experiments by Low and Sambon were carried out.

623. Photograph of Sir Ronald Ross and Lady Ross at the Laboratory in Calcutta, where the original malaria-mosquito work was done in 1898-1899.

624. Two Illustrations by Watson, showing the harm resulting from malaria invasion.

III.—ÆTIOLOGY

625. Summary :—

Malaria is caused by a protozoan parasite belonging to the class *Sporozoa*, whose definitive host is the *mosquito*, and intermediate host *man*.

Three species of parasite are recognised :—

Plasmodium malariæ—benign.
Plasmodium vivax—benign.
Plasmodium falciparum—malignant.

Laveran and, more recently, Grassi, have maintained that there is only one (polymorphic) species of parasite. This view is not generally accepted.

Malaria is spread from man to man by the Anophelini, a tribe of mosquitoes belonging to the sub-family Culicinæ ; up to the present no other mosquitoes have been found to act as hosts for the human parasite.

Among the many species known to carry malaria are included : *Anopheles maculipennis, Anopheles bifurcatus, Anopheles culicifacies,*

Anopheles costalis, Anopheles funestus, Anopheles ludlowi, Anopheles pseudopunctipennis, Anopheles albimanus, Anopheles pharoensis, Anopheles turkhudi, Anopheles superpictus and *Anopheles fuliginosus.*

Infection is liable to occur under any conditions which expose man to the bite of infected mosquitoes.

The association of breeding-grounds, human habitations and an infected native population provides all the necessary factors for a heavy local incidence. The importance of high temperature has long been recognised, but recently Gill has laid stress upon high relative humidity as a dominant factor in the development of the malarial parasite within the mosquito.

There are many varieties of mosquito breeding-grounds, which may conveniently be divided into :—

(1) Woodland, including water collection in tree holes, leaves, etc.

(2) Ponds and streams.

(3) Swamps, including flooded rice fields.

(4) Domestic and municipal, including barrels, broken guttering, wells, borrow pits, etc.

626. Three large paintings by Terzi are shown, illustrating *Anopheles maculipennis, Anopheles bifurcatus, Anopheles funestus,* and the three varieties of malaria parasites.

627. In a series of coloured drawings are shown the various forms of malaria parasite, the development of the parasite in the mosquito, and a number of breeding-grounds of this insect.

The benign tertian, quartan and malignant parasites are shown : (1) in their development from early rings to rosette forms, and (2) in their sexual forms as male and female gametocytes.

628. In three diagrammatic coloured drawings are represented the infection of the mosquito and the stages which ultimately lead to infectivity for the healthy individual.

629. Paintings of various Breeding-Places are shown :—

Forest pool with vegetable growth and absence of small fish.

Flooded rice fields.

A leaking irrigation channel, and badly-drained irrigated land.

Sand-banked pools left by a falling tropical river.

Type of Malayan hill stream. Breeding-place of a special species of Anopheline.

Forest breeding-places. Hollow tree trunks and branches, water-bearing agaves, cut bamboos, and *Nidularium ampullaceum.*

Anopheline pools, puddles and ditch in the insanitary roadway of a tropical town.

Mangrove swamp in the shallow portions of which Anophelines breed.

House at the base of a hill and adjacent to tropical swamp. Note faulty rain-gutter, unscreened barrel, pineapples which harbour water, and water-bearing epiphytes upon a tree.

Boat containing water collection and hoof-mark pools beside a tropical stream.

Shallow uncovered well. An infrequent breeding-place of Anophelines.

Water tank in tropical garden.

Flooded borrow-pits and water channel beside railway track.

630. A detailed description of the three species of malaria parasites :—

Plasmodium vivax (Grassi and Feletti, 1890).

Causes benign tertian malaria. Parasite requires 48 hours to complete asexual cycle. Attacks every third day. Sporozoites or merozoites approach red cell, indent it, and force way into stroma of corpuscle.

(1) Disc of cytoplasm with single nucleus.

(2) Vacuole appears, nucleus pushed aside. Very amœboid and active.

(3) Growth of parasite ; corpuscle enlarged, paler and containing Schüffner's dots.

(4) Continued growth, very irregular shape, numerous yellowish-brown pigment grains.

(5) Nucleus breaks up—chromatin granules forming chromatin and daughter nuclei. Typically 16 nuclei present (12–24).

(6) Parasite larger and practically fills corpuscle, which is now about 10 or 11 microns.

(7) Cytoplasm segments and merozoites are formed.

(8) Bursting of corpuscle. Pigment taken up by various leucocytes, large endothelial cells, etc.

(N.B.—After a mosquito has injected sporozoites, the initial attack of malaria occurs in 10–12 days ; *i.e.*, it requires several cycles to produce sufficient numbers to give rise to symptoms.)

After schizogony has been repeated several times, gametocytes appear —usually 10–14 days after initial attack.

The process of growth from merozoite to gametocyte takes place almost entirely in the vessels of the spleen or bone marrow, where the affected red blood corpuscles are held up. Amœboid action not marked. Corpuscles increase in size and Schüffner's dots develop. *Male :* pale cytoplasm, diffuse nucleus ; *Female :* dense cytoplasm, compact nucleus. In both sexes pigment granules are scattered through the cytoplasm.

Supposed reproduction by Parthenogenesis.

Schaudinn's theory is probably incorrect ; the condition described being the result of double infection of a cell by schizont and gametocyte *(see Illustrations)*.

Plasmodium malariæ (Laveran, 1881).

Causes quartan malaria. Fever at intervals of seventy-two hours. Ring forms resemble those of *Plasmodium vivax*. Cytoplasm rather denser. Very little amœboid movement. Coarse and dark-coloured pigment granules. Organism tends to be stretched as a band across the corpuscle. Size of red blood corpuscle not increased, and may be darker in colour. No Schüffner's dots. Mature forms completely fill cell, pigment granules collected into central mass. About eight merozoites. During whole growth period the infected cells can be seen in the peripheral blood. Gametocytes are spherical bodies, completely filling the red blood corpuscles.

Plasmodium falciparum (Welch, 1897).

Causes malignant tertian malaria in man. Attacks irregular, often every alternate day or daily.

Very minute ring forms, many corpuscles parasitised—up to 25 per cent. Multiple infection of corpuscles. Chromatin granule projects beyond the margin of the ring. In many rings two chromatin granules may be present. "Bridge" and "Marginal" forms very common. Growth of *Plasmodium falciparum* difficult to see, because infected cells are held up in the capillaries of internal organs, owing to tendency to clump together. They also tend to adhere to large mononuclear and probably endothelial cells *(see Illustrations)*. Red corpuscles are increased in size, Maurer's dots occur, less numerous and more difficult to see than Schüffner's dots. The fully-formed schizont has a diameter of about five microns, and occupies only about two-thirds of the diameter of the corpuscle.

Nucleus multiplies. Merozoites 8–24 (average 16). Schizogony almost entirely in internal organs. Certain merozoites finally grow into gametocytes, which carry on further development in Anopheline mosquitoes. The gametocytes are crescentic or sausage-shaped. Nuclear and cytoplasmic differences as for *Plasmodium vivax*.

631. The various points are illustrated in a series of coloured drawings, which include the original paintings for Wenyon's "Protozoology"; also illustrations of the *Plasmodium tenue* of Stephens, and a plate illustrating Schaudinn's theory of parthenogenesis.

632. Cycles in the vertebrate hosts and in the mosquito are as follows:—

Cycle in vertebrates *(see Screen Illustrations)*:—Sporozoites inoculated in saliva of biting mosquitoes. Sporozoites invade red blood corpuscle. Growth at expense of cell (hæmoglobin absorbed and transformed into pigment in parasite). After two or three days, daughter-nuclei form (number varies with species); corresponding number of merozoites develop. Rupture of red cells. Merozoites in plasma (residual body with pigment phagocyted by leucocytes). Invasion of red blood corpuscles by merozoites. Schizogony repeated.

After several generations have been produced, certain merozoites, instead of developing into schizonts, become gametocytes (numerous pigment granules and single nucleus). The female or macro-gametocyte has a deeply-staining cytoplasm and compact nucleus. The male or micro-gametocyte has a faintly-staining cytoplasm and diffuse nucleus.

These gametocytes must die if they do not reach a mosquito's stomach.

633. Cycle in the Mosquito.

Further development of gametocytes will take place only in Anopheline mosquitoes in cases of human malaria, and Culicine mosquitoes in cases of bird malaria.

Red corpuscles in mosquitoes' stomach rupture by movement of gametocytes, which escape; during this process the pigment granules of the male are in a state of violent commotion. The process of breaking-up of nucleus, cytoplasm extrusion, etc., produces "flagellating body." The flagella-like structures are really microgametes which break loose and swim about, so that eventually one may come into contact with and fertilise a macrogamete, forming a motionless sphere or zygote. Soon this elongates and becomes motile, gliding about amongst the intestinal contents. The male and female nuclei approach one another and fuse. The vermicule then passes through the stomach wall until it lies just below the elastic membrane of the stomach, which takes part in the formation of the cyst wall. The nucleus of the zygote multiplies by repeated divisions.

The cytoplasm is reduced to a sponge-work of numerous anastomosing septa. Sporozoites are formed all over these cytoplasmic surfaces. Irregular masses of sporozoites may form *(see Coloured Drawings)*. Eventually the sporozoites break loose and lie within the cyst; they are about fifteen microns long.

The mature oöcyst now breaks and liberates the sporozoites into the body cavity or hæmocœle. They are motile and wander all over the mosquito's body, and may be found in any organ *(see Illustrations)*. The majority come in contact with the salivary gland, which they penetrate, being finally ejected with the saliva when the mosquito bites.

Probably "black spores" are due to the death and degeneration of the oöcyst contents at various stages of development.

These are shown in the illustrations already mentioned; also in six coloured drawings (Wenyon's originals).

634. A painting is also shown of *Plasmodium falciparum* as seen in a spleen smear from a fatal case of malignant tertian malaria.

635. A large diagrammatic representation of the cycles in the human blood and in the mosquito is also shown.

636. Bass and Johns, in 1912, were the first to succeed in cultivating the malarial parasite. Illustrations are shown of their methods and results.

637. The development of the malarial parasite in the mosquito is also shown in a series of photo-micrographs by King.

638. Two illustrations by Mühlens show sporozoites in a palpus and in the scutellum of the mosquito.

639. Coloured photo-micrographs are shown in the special viewing-case, illustrating phases in the life-history of the malaria parasite, both in the mosquito and in man :—

(1) Benign Tertian. Broken-up rosette. Two young forms in corpuscles. × 1000.

(2) Benign Tertian. Two half-grown parasites and one earlier. × 1000.

(3) Benign Tertian, showing half-grown parasite and Schüffner's dots. × 1000.

(4) Benign Tertian. Commencing rosette formation.

(5) Benign Tertian. Rosette. × 1000.

(6) Benign Tertian. Gametocytes. × 1000.

(7) Quartan. Rings. × 1000.

(8) Quartan. Half-grown. × 1000.

(9) Quartan. Band form. × 1000.

(10) Quartan. Early rosette and fully grown. × 1000.

(11) Quartan. Rosette. × 1000.

(12) Quartan. Gametocytes.

(13) Malignant Tertian. Ring forms. × 1000.

(14) Malignant Tertian. Rosette and young forms. × 1000.

(15) Malignant Tertian. Spleen smear ; young and fully grown forms, also early rosettes. × 1000.

(16) Malignant Tertian. Crescents : male and female. × 1000.

(17) Section of human intestine showing numerous parasites in red blood corpuscles. Peripheral blood almost free. × 300.

(18) Same as last. × 750.

(19) Malarial Brain. Section showing capillary blocked with *Plasmodium falciparum*.

(20) Benign Tertian Malaria. Flagellating body and leucocytes.

(21) Macro- and micro-gamete in stomach of mosquito, the latter possibly still attached to remains of crescent. × 1000.

(22) Benign Tertian Malaria. Sporozoites and residual body from cyst on stomach wall of mosquito.

(23) Section of stomach of *Anopheles maculipennis*. Cysts in wall. (Experimental).

(24) Smear of salivary gland of mosquito, showing cell with sporozoites in and around. × 1000.

640. The Mosquito Host.

Wax models are shown illustrating *Anopheles costalis* (× 28), an important African carrier of malaria in all stages of development :—

(1) Egg.
(2) Larva.
(3) Pupa.
(4) Imago.

641. Illustrations are shown of various Anopheline eggs, also of methods of breeding and dissection.

642. In four illustrations are shown the differences between the Anopheline and Culicine mosquito, both in the developmental and adult stages.

643. Photographs by Marshall illustrate the following mosquitoes :—

(1) *Theobaldia annulata* (female).
(2) *Theobaldia annulata* (male).
(3) *Culex pipiens* (female).
(4) *Anopheles maculipennis* (female).

(It is the female alone who is responsible for infection).

644. A photograph by Marshall shows egg-raft and newly-hatched larvæ of *Theobaldia annulata*.

645. Exhibit of malaria-carrying mosquitoes :—

Europe : *Anopheles maculipennis.*
Asia : *Anopheles stephensi.*
Anopheles listoni.
Anopheles pattoni.
Anopheles maculipennis.
Anopheles culicifacies.
Africa : *Anopheles maculipennis.*
Anopheles funestus.
Anopheles costalis.
Australia : *Anopheles annulipes.*
North and South America : *Anopheles maculipennis.*
Anopheles tarsimaculatus.
Anopheles albimanus.

Breeding-Grounds of Mosquitoes :—

646. A series of six paintings is shown to illustrate the main divisions of such breeding-places :—

(1) Domestic.
(2) Woodland.
(3) Ponds and streams.
(4) Marsh-land.

Breeding-Ground : Refuse heap with tins.
,, ,, Water-tub.
,, ,, Tree-holes.
,, ,, Pond.
,, ,, Stream.
,, ,, Marsh-land.

647. A large number of photographs are exhibited, showing various breeding-grounds :—

Water barrel, unprotected and swarming with mosquito larvæ, Accra, Gold Coast. Presented by Sir William Simpson, C.M.G.

Bermuda : Heap of rubbish, behind which mangrove trees standing in swamp. From Lieut.-General Sir John Asser, K.C.M.G.

Food safe and anti-formicary, the latter full of Stegomyia larvæ. Port Louis.

Western Cemetery, Port Louis, Mauritius. Jars for flowers, breeding-places for mosquitoes.

Kuala Selangor, Federated Malay States, showing boat in the water in the hold of which *Anopheles ludlowi* were found developing. From Dr. A. R. Wellington.

Collection of odd water receptacles, the work of a few days, Bridgetown, Barbados. Boyce : " Mosquito or Man ? "

View in one of the Basra date groves, showing irrigation channels in the spills from which, at high river, *Anopheles (A. pulcherrimus* and *A. stephensi)* are found breeding.

Pools left after rain, Khartoum, Sudan. These were formed by a rainfall of 1·8 inches of one hour thirty minutes' duration. Some of these persisted for about three weeks.

" *Regard,*" Port Louis, Mauritius. Breeding-place for Stegomyia. Crowds of larvæ in water in little hole.

Borrow-pits in pig village of Owusu. Report of the Medical Officer of Health, Accra, for the year 1922.

Rice fields with cottages. A typical mosquito-breeding area. From Dr. Minett, British Guiana.

Irregularly graded drain, showing pools receiving water from water stand-pipe, Freetown, Sierra Leone. Presented by Sir William Simpson, C.M.G.

Drain, showing stagnant pools, owing to want of proper grading and levelling, Freetown, Sierra Leone. Presented by Sir William Simpson, C.M.G.

A road culvert placed at too high an elevation to drain completely, a " man-made " mosquito-producing area. " Malaria and the Engineer," : published by the St. Louis S.W. Railway.

Grass fields near golf-course, showing stagnant drains on each side of railway. Presented by Sir William Simpson, C.M.G.

Mosquito Breeding-Places.—Flooded paddy fields (opposite the railway station). Water supplied from Wenaruwewa tank. This picture shows in the foreground pools formed by the hoof-marks of cattle, in which Anophelines breed. *After* Manson-Bahr. Permanently flooded paddy fields (on the Rajaphilla road). These fields are supplied by well-water and constitute a permanent breeding-ground of Anophelines. *After* Manson-Bahr.

Swamp region, near Butiaba, Lake Albert. Sir Andrew Balfour.

Brackish swamp at Roche Noir, separated from sea by ridge of sand; *Anopheles costalis* nursery in the summer.

Showing new village with pitch-hole on the edge of the lake in the foreground. Presented by Dr. E. de Verteuil.

Anopheline pools, Ceylon. Presented by Dr. Manson-Bahr, D.S.O.

Mosquito breeding-places, Southern Algeria. "Bull. Soc. Path. Exot.," Vol. V.

Mosquito breeding-places, Algiers. *After* Ross.

The danger of water in contact with new earth in the Federated Malay States. A breeding-ground of *Anopheles ludlowi*. From Dr. A. R. Wellington.

Actual breeding-places of Anopheline mosquitoes in the Eastern Transvaal. *After* Ross.

Ezra's Tomb, Tigris. The swamps at the back are a favourite breeding-ground of *Anopheles (A. pulcherrimus* and *A. sinensis)*.

Natural nullah in mountain stream, Hong Kong, showing formation of mosquito breeding-pools. Clark.

Rock pool in compound between dwelling-house and cess-pit. Presented by Sir William Simpson, C.M.G.

Actual breeding-places of Anopheline mosquitoes on the Crocodile River, Eastern Transvaal. Typical of many places along the river where the broken rocky ground holds many small pools after rain, or when the river is falling. *After* Ross.

The danger of water in contact with new earth in the Federated Malay States. Holes cut in alluvial soil near the coast for the reception of building foundations. Water contained therein soon became thickly populated with larvæ of *Anopheles ludlowi*, a noted fever carrier. Natural water on the surface (old earth) contained very few. From Dr. A. R. Wellington.

Fishermen's huts on Lake Langaza, a haunt of *Anopheles maculipennis*.

Views of various parts of Nefisha swamp near Ismailia. Breeding-place of *Anopheles (A. pharoensis)*. Part of filled-in area showing re-infiltration with water.

Thinned-out lotus water-bed, Palace Gardens. Bad breeding-ground. *Indian Medical Gazette*, December, 1914.

Mweera River, Zanzibar Protectorate, about seven miles from the town. In former days the seat of a district officer. Note the Government bungalow in close proximity to the river. Mosquito Brigade boy dipping for larvæ. The larvæ of *Anopheles funestus* abound in the sides of the river. From Dr. W. Mansfield-Aders.

Sebelini Kubwa Swamp, about two miles from Zanzibar town. A permanent breeding-ground of *Anopheles costalis*. Note the shallow edges and scrub, an ideal place for Anopheline larvæ. From Dr. W. Mansfield-Aders.

Portion of Monastir Swamp, showing pool in which larvæ of *Anopheles maculipennis* were found. All this part of the swamp was eventually drained. Photo by Captain Armour, No. 4 Canadian Hospital, Salonica.

Malaya.—Stream in hill land, in which *Anopheles maculatus* breeds. Watson.

Mangrove trees at Port Swettenham, amongst the reeds of which Anophelines breed. Watson.

View of lower part of Wady Kelt, formerly a breeding-place of *Anopheles palestinensis*.

View up stream of the Mweera river. The large plants with fleshy leaves at the side of the stream are a species of Colocasia. Between these plants the larvæ of *Anopheles funestus* are abundant. From Dr. W. Mansfield-Aders.

Sebelini Kubwa swamp. Taken from another point of view. Permanent breeding-ground of *Anopheles costalis*. In the foreground a member of the Mosquito Brigade dipping for larvæ. From Dr. W. Mansfield-Aders.

Pool under cliff at Cape Hellas, in which larvæ of *Anopheles palestinensis* were found.

Another view of the Mweera river. Boy hunting for Anopheline larvæ. From Dr. W. Mansfield-Aders.

Another view of ponds in Owusu, breeding *Anopheles costalis*, before being filled in. Report of the Medical Officer of Health, Accra, for the year 1922.

648. Paddy Fields under Water.

Planting out the Paddy. *Country Life*, 29th December, 1919.

649. The danger of clearing natural vegetation covering the wet inverts of valleys in Malaya. *Anopheles maculatus* breeds in pools and seepages of spring water exposed to the light, but avoids water in deep shade. From Dr. A. R. Wellington.

650. Silk Cotton Tree *(Eriodendron anfractuosum)* in flower, showing numerous parasitic "wild pines" in which the larvæ of five different species of mosquitoes were found. Boyce.

651. Tree Holes as Breeding-Places. Breeding-places, Grenada. *Bulletin of Entomological Research,"* Vol. II, part 3.

(1) Hole in an Avocada pear tree, in which *Wyeomyia grenadensis* was breeding. In the fork of the tree is an ants' nest.

(2) Boulder stream in Grenada, which is exposed to the sun and swarms with Anopheline larvæ after flooding.

(3) Artificial hole in a mango tree, forming a breeding-place for *Megarhinus*.

652. Woodland Breeding-Places: Trees, etc. Boyce, "Mosquito or Man?"

(1) Water-holding and mosquito-breeding epiphytes upon a tree. Trinidad.

(2) Bamboo. The cut cane frequently holds water in which mosquitoes breed.

(3) An example showing how water-holding plants may act as mosquito breeding-places. Species of genus *Bilbergia*, in which larvæ and pupæ of *Scutomyia notoscripta*, *Stegomyia fasciata* and *Culex fatigans* have been noted. *Annual Report of Commissioner of Public Health*, Queensland, 30th June, 1914.

(4) Saman tree, covered with water-holding mosquito-breeding epiphytes *(Bromeliaceæ)*.

(5) Example of water-holding tree. *Poinciana regia*, which has been prevented from further acting as a breeding-place of *Scutomyia notoscripta* by the deposition of cement in the cavity marked X. *Annual Report of Commissioner of Public Health*, Queensland, 30th June, 1914.

Bromelia.

653. Specimen of Bromelia. Liable to hold water and form mosquito breeding-grounds.

SPECIMENS

654. Model of eggs of Anopheline. N.B.—In ring are some eggs showing the actual size.

655. Model of Anopheline egg.

656. Model of raft of eggs of *Culicini*. N.B.—Floating loose are a few empty egg cases. (In ring are actual rafts.)

657. Larvæ and Pupæ of various *Culicidæ*:—

Toxorhynchites brevipalpis Theo. A predaceous larva.

Culex tigripes Grand. and Ch. A predaceous larva.

Culex fatigans Wied. The adult carries filariasis.

Anopheles costalis Loew. The adult is the chief malaria carrier of Africa.

Anopheles funestus Giles. The adult carries malaria in India, Burma, Ceylon and tropical Africa.

IV.—PATHOLOGY

658. Summary :—

Enlargement of the Spleen. In acute cases, it is soft and dark-red in colour ; in chronic infections, it is harder and may have a dark, steely-grey tint due to pigment. The liver is also enlarged, but to a less extent, and may be pigmented.

Blood thin and watery, number of red cells reduced out of proportion, surviving cells irregular in size and shape, and contain less hæmoglobin than normal. Leucopenia with increase of large mononuclears. Leucocytes pigmented. Capillaries of infected organs may show varying numbers of red cells infected with malarial parasites. Capillaries of the brain, spleen, intestine, liver or other organs, may be completely blocked by veritable emboli of infected cells *(see Illustrations and Colour Photographs).*

The following illustrations are shown of various pathological conditions :—

659. Confluent multiple punctiform hæmorrhages, due to *Plasmodium falciparum.* From Professor Dürck, 1917. Thrace. *(Copyright.)*

660. Multiple punctiform hæmorrhages in brain substance in a case of infection with *Plasmodium falciparum.* From Professor Dürck. *(Copyright.)*

661. Multiple punctiform hæmorrhages in cerebellum, due to invasion of *Plasmodium falciparum,* causing coma. From Professor Dürck, 1916. Üsküb.

662. *Plasmodium falciparum* invasion of cortex of cerebellum with cellular proliferation. From Professor Dürck. *(Copyright.)*

663. Blocking of a small vein of the cerebral cortex with shed endothelial cells and plasmodia. Malignant malaria. From Professor Dürck, 1916. Üsküb. *(Copyright.)*

664. Typical malarial nodule in the medullary substance of the cerebrum. " Daisy " figure formed by proliferation of glia-producing rod cells. From Professor Dürck. *(Copyright.)*

665. *Malaria.* Liver from a case of malaria of long standing. Endothelial cells and wandering cells in the capillaries are loaded with clumps of pigment. MacCallum : " A Text-book of Pathology."

666. *Malaria.* Capillary in the brain, filled with parasites of the æstivo-autumnal type. MacCallum : A Text-book of Pathology."

667. Illustration of section of brain, showing thrombosed vessels. Dudgeon : " Ophthalmological Society's Transactions," Vol. XLI.

668. Clumping of the malignant tertian parasite around a large mononuclear leucocyte. In culture forty-five hours. McLay.

669. Section of fibrous nodule on surface of human spleen, due to malarial perisplenitis. Mann's Stain. (× 26)

670. Section of malarial spleen, showing capillary blocked with parasitised corpuscles. (× 1500)

671. Malarial parasites in human brain—From Professor Plimmer's collection. Presented by Dr. W. Mansfield-Aders.

671A. Malignant tertian rings—From Professor Plimmer's collection. Presented by Dr. W. Mansfield-Aders.

672. Clumping of parasites around large mononuclear leucocytes, but not around the polymorphonuclear leucocytes (p). In culture thirty-four hours. McLay.

673. Section of cardiac muscle. Stained with Scharlach R. and hæmalum. Case of pernicious malaria, showing extreme degree of fatty degeneration of cardiac muscle. *Quarterly Journal of Medicine*. Vol. 12.

674. Splenic pulp in aestivo-autumnal infection, showing many pigmented parasites either free or enclosed in large phagocytic cells. MacCallum, "A Text-book of Pathology."

675. Section of brain from a case of malignant malaria :—

(1) Transverse section of capillary showing invaded corpuscles peripherally placed.

(2) Large blood vessel with no infected corpuscles.

(3) Longitudinal section of capillary.

(4) Oblique section of capillary.

676. Section of villus of human intestine, showing large infection of *Plasmodium falciparum* in blood corpuscles. Parasites were found in the peripheral blood only after very prolonged search in this case.

677. Eye changes in Malaria :—

Fig. 1. Shows a microscopical section of the optic nerve, with intravascular parasites.

Fig. 2. Shows a section of the retina, with a vessel containing infected red cells.

678. Splenomegaly (Malarial). Spleen removed from a Tartar, aged 16 years. Weight, 820 grammes. Size, $9'' \times 4\frac{1}{2}'' \times 2\frac{1}{2}''$. Kopylow. "Archiv. für Klinische Chirurgie."

679. Splenomegaly (Malarial). Spleen removed from a Tartar, aged 30 years. Weight, 2020 grammes. Size, $13'' \times 7'' \times 3\frac{1}{6}''$. Kopylow. "Archiv. für Klinische Chirurgie."

680. Splenomegaly (Malarial). Spleen removed from a man aged 50 years. Weight, 2880 grammes. Size, $13'' \times 7'' \times 2\frac{1}{3}''$. Kopylow. "Archiv. für Klinische Chirurgie."

681. Splenomegaly (Malarial) Spleen removed from a Turkish woman, aged 35 years. Weight, 1300 grammes. Size, $11\frac{1}{2}'' \times 6\frac{1}{4}'' \times 2\frac{1}{3}''$. Large cyst at lower border of front surface. Kopylow. "Archiv. für Klinische Chirurgie."

Pathological Specimens.

682. Brain, from fatal case of cerebral malaria. Presented by Colonel F. P. Mackie, O.B.E., I.M.S.

683. Brain, from case of malignant tertian malaria. Cerebral vessels were found blocked with parasites. Presented by Dr. Lawrence G. Fink, Rangoon.

684. Brain, from case of subtertian malaria, showing hæmorrhage and capillaries blocked by parasites. Presented by Prof. L. S. Dudgeon, C.M.G., C.B.E.

685. Ruptured aortic aneurism, West African Native. This is a fairly common lesion among these natives. Presented by Dr. Scott Macfie, D.T.M.

686. Portion of intestine from fatal case of malignant malaria. Microscope slides show numerous parasites.

687. Liver in malignant tertian malaria. Presented by Dr. L. G. Fink, Rangoon.

688. Specimen of a ruptured spleen (Dr. Ingram's case). Presented by Dr. Scott Macfie, D.T.M.

689. Spleen, showing white patches and nodules. ? cause. Attributed to malarial perisplenitis. Presented by Dr. Scott Macfie, D.T.M.

690. Spleen, showing white patch. This condition is commonly found at post-mortems on West African natives and is attributed to malaria. Presented by Dr. Scott Macfie, D.T.M.

691. Malarial spleen. Presented by Dr. Minett.

692. Splenomegaly, the result of malaria. Note pigmented area at periphery. Red colour due to bad fixation. Presented by Dr. Bayon.

693. Malarial spleen. Presented by the Royal College of Surgeons' Museum.

694. Enlargement of Spleen—malaria.

V.—SYMPTOMATOLOGY

695. Summary :—

General Appearance.—In cold stage, pinched and blue face. In hot stage, flushed. In malarial cachexia, earthy colour with pigmentation. Herpes labialis and jaundice may occur. In chronic infection anæmia may be extreme *(see Paintings)*.

Temperature.—Cold stage, with temperature rising; hot stage, with temperature sustained for four to six hours. Rapid fall during sweating stage *(see Charts)*. In malignant tertian, a prolonged hot stage (fifteen to thirty-six hours) is a marked feature. The hyperpyrexial form may resemble sun-stroke.

Rapid pulse, nausea and vomiting are commonly present. Respiratory lesions and various skin eruptions may occur.

Nervous symptoms: coma, delirium, etc., occur in severe cases.

Some authors have recorded cases of multiple neuritis; that these are malarial in origin is doubtful *(see Illustrations)*.

Plugging of retinal arteries *(see Pathological Illustrations)* may lead to transient or lasting blindness.

The spleen is enlarged and painful *(see Specimens and Illustrations)*. Cachexia is frequently extreme.

Gangrene and ulcers of the extremities have been described, also stunting of growth due to prolonged infection *(see Illustrations)*.

696. Four coloured Temperature Charts show the stages of the parasite in relationship to the various phases of the attack.

696A. A series of Temperature Charts is also shown of all three varieties of the disease, and also of typhoid fever simulating malaria.

697. The following clinical illustrations are shown:—

Chronic malaria, showing enlarged spleen.

Case of chronic malaria, showing characteristic pigmentation. Dr. Manson-Bahr's case.

Malarial cirrhosis of liver, ascites and pellagra. From the Royal Society of Tropical Medicine and Hygiene.

Types of malarial cachexia. Deaderick.

Stunting of growth due to malaria. Age 18. Height: 1 m. 30. *Reforma Med.*, 12th March, 1922.

Stunting of growth due to chronic malaria. Age 24. *Reforma Med.*, 13th March, 1922.

Malarial ulcers in British Central Africa. David Kerr Cross: *Journal of Tropical Medicine and Hygiene*, November, 1900.

Malaria infected family. Rice report.

Chronic malaria in Paraná. *After* Araujo.

Chronic malaria cases, showing enlarged spleen. *After* Araujo.

Multiple gangrene in malaria fever. Osler: *Journal of Tropical Medicine and Hygiene*, December, 1900.

Polyneuritis of malarial origin. Rare condition. Mendelson: *Journal of Tropical Medicine and Hygiene*, 1st June, 1922.

Case of malaria in a child, showing emaciation, enlarged spleen and ascites. *After* Ruge and Verth. *Tropenkrankheiten und Tropenhygiene*. Vol. 6.

Malaria cachexia. Marked splenomegaly. *After* Leon.

698. Two Paintings are shown, illustrating the anæmic condition resulting from chronic malaria.

699. Four Temperature Charts of cases treated by Dr. Manson-Bahr, illustrate :—

(1) Benign tertian malaria.

(2) Quartan malaria.

(3) Subtertian malaria simulating typhoid fever.

(4) Inoculated malaria in a case of general paralysis.

700. Diagnostic illustrations are shown of the method of taking blood for making films and the preparation of thick films.

VI.—TREATMENT

701. Summary :—

Simple Benign Tertian or Quartan Attacks.

Wait until rigor and hot stages are over. When the skin is moist and temperature begins to fall, give gr. 10 of quinine, and then thrice daily after meals for a week.

If patient is constipated a saline purge should be given before the quinine.

To prevent recurrence, Manson-Bahr recommends a mild saline in the morning, and three 5-gr. doses of quinine during the day, once a week for two months. (The American standard treatment gives gr. 10 daily for two months.)

A tonic of iron and arsenic may be given after the first week.

If the sulphate is given in solution, it must have one minim of acid. sulph. dil. for each five grains.

Quinine hydrochloride is better ; it should be taken in water.

Toxic Effects of Quinine.—Singing in ears, visual disturbances, deafness, amblyopia, gastric and cardiac disturbances, syncope, urticaria.

Euquinine.—The ethyl carbonate of quinine is tasteless and effective.

Warburg Tincture.—An effective preparation. The dose is half an ounce, repeated after two or three hours.

Cinchona Febrifuge.—Is a preparation containing the total alkaloids extracted from cinchona bark. It is especially useful in benign tertian attacks owing to the high proportion of quinidine it contains. Issued by the Indian Government in 3-gr. tablets. Knowles gives it combined with alkaline treatment in gr. 10 doses three times a day.

Esanofele.—Is a proprietary preparation, much used in Italy. It contains quinine, arsenic and iron. The dose varies according to age from two to six pills a day.

Plasmoquin (Plasmochin).—Effective rapidly against all forms of the parasites except the subtertian schizont. All gametocytes—including crescents—are quickly killed. Occasionally produces a severe cyanosis ; this may be counteracted by combining with minute quantities of quinine. Hence Plasmoquin Compound is now used in tablet form, each containing 0·01 gm. of plasmoquin and 0·125 gm. of quinine. A very effective

treatment. Crescents disappear in three days. For an adult two tablets may be given three times daily for seven days, then four days' interval. Repeat course four times, and end with a seven days' course of one tablet three times a day. For infants, one tablet daily.

Stovarsol in 4-gr. tablets. Dose equals one to two tablets daily for ten days. Possibly the effect is chiefly due to the tonic action.

Treatment of Subtertian Malaria.

Mild cases as for benign tertian. Rest is of special importance. In endemic areas large doses of quinine may precipitate an attack of blackwater fever.

Intramuscular Injection of Quinine.

Sometimes painful and may be dangerous.

Indications: Inefficiency of oral administration, severe vomiting or gastritis, severe toxic or pernicious symptoms.

The bihydrochloride is the best salt of quinine to use.

A stout platino-iridium needle should be employed.

Solution freshly prepared and boiled. Needle and syringe sterilised.

Nine grains of quinine bihydrochloride in 1 c.c. of saline may be injected daily for three successive days. After injection, gentle massage is useful.

Intravenous Injection of Quinine.

In pernicious cases, where very rapid action is indicated, the bihydrochloride, gr. 10, in 10 c.c. of distilled water. Boil in a test-tube before use and inject into median basilic vein.

Inject slowly, taking at least three minutes over the 10 c.c.

The liberation of toxin may kill the patient; it is probably a good plan to give a small intramuscular injection first, and to follow it up in six or eight hours with a 6-gr. intravenous injection.

In cerebral malaria a 15-gr. dose may be given.

For Hyperpyrexia.

Cold bath, ice bag, etc. Give bath when temperature is 106° F. and stop at 102° F.

General.

Every case of malaria with fever should be nursed in bed. Subtertian infections should not be left alone, as they may become maniacal. Keep warm, change clothing when wet, give lemonade. Food: fluid and digestible. During convalescence, if patient has a good appetite, full diet.

Excretion of Quinine and the Picric Acid Method of Estimating Quinine in the Urine.

Two hundred c.c. of urine are acidified with a few drops of dilute sulphuric acid and boiled.

One to 1·5 grammes of dried picric acid are added to the hot mixture and stirred in. The whole is allowed to stand for at least one hour with stirrings at intervals. The liquid is then filtered through a filter paper of diameter not larger than 4½ inches until the filtrate comes through clear. The filtrate must give no precipitate with a saturated aqueous solution of picric acid.

The precipitate and filter paper are transferred without washing to an Erlenmeyer flask, 50 c.c. of 3 per cent. caustic soda is added, and the whole heated on the water bath for half an hour with occasional shaking of the contents. The flask is cooled and the contents are transferred to a separate funnel and extracted three times with 50 c.c. of chloroform. The chloroform extract is collected in a flask and the chloroform is distilled off.

The residue is re-dissolved in dilute sulphuric acid. The solution is transferred to a separating funnel, is extracted twice with alcohol to remove pigment, is then rendered alkaline with 3 per cent. caustic soda and shaken out three times with chloroform.

The three chloroform extracts are run into a tared flask, the chloroform is distilled off, the flask dried at 120° C. to constant weight, and weighed. The residue is quinine together with any other alkaloids present in the urine.

Using the above method, Hele has determined the following points:—

(1) In health, quinine is eliminated more rapidly after oral than after intramuscular administration.

(2) The excretion rate of quinine in health shows no great fall from the second to the twelfth hour after an oral dose, from the fourth to the eighteenth hour after an intramuscular dose, and from the second to the twelfth hour after an intravenous dose.

It is suggested that the quinine concentration in the blood is relatively constant over the same periods. The excretion rate of quinine falls off rapidly after the first day. Elimination may continue for ninety-six hours.

(3) The excretion rate of quinine in malaria is similar to that in health, but there is greater variation after oral administration.

(4) The amount recovered from the urine varies from 10–30 per cent. of the administered dose.

(5) There is no evidence of any decrease of elimination during the course of the treatment.

(6) There is very little difference in the excretion of quinine in black-water fever cases.

(7) Only traces of quinine can be detected in the fæces. (Hele.) *Journal of the Royal Army Medical Corps*, April, 1922.

Two Photographs :—

702. Pelletier, Pierre Joseph, 1788–1842.
Isolated quinine, 1820, also strychnine, brucine and veratrine.

703. Caventou, Joseph Bienaimé, 1795–1877.
Isolated quinine, 1820, also strychnine, brucine and veratrine.

704. Production of Cinchona Bark.

The original source of supply of cinchona bark was South America, where the cinchona species are indigenous in the forests of the Andes between 10° N. lat. and 19° S. lat. Small supplies of bark are still obtained from these areas, though in comparison with the Java output it is quite insignificant. In the Imperial Institute Report, 1922, the total output has been recorded :—

Java	23,000,000 lbs.
India	2,000,000 lbs.
Other countries	400,000 lbs.

Cinchona bark of good quality is grown at St. Helena, and also in the Cameroons and East Africa. It seems likely that cinchona could be grown successfully on the hills of British Malaya.

705. Production of Quinine. Series of photographs.

Children " barking."

Weighing bark brought in from the plantation. Bark-drying shed in the background.

Portion of a ridge covered with *Cinchona Ledgeriana*. About six years old.

Cinchona Ledgeriana, probably about 7 or 8 years old.

Cinchona succirubra, probably about 9 or 10 years old.

A strip of bark being removed from a tree of *Cinchona Ledgeriana* for analysis of its quinine contents.

Part of a block of *Cinchona Ledgeriana*, showing six months' old plants.

Portion of a block of *Cinchona Ledgeriana*, showing plant of about 18 months old.

Portion of a block of *Cinchona Ledgeriana*, probably about five years old.

Young *Cinchona Ledgeriana* plants in a nursery line almost ready for planting out.

Transplanting seedlings in a nursery line.

Moderately distant view of a Cinchona nursery showing the shades from which the bamboo mats have been removed so as to allow the sun to get direct access to the young plants.

Exploration camp. Hunting for suitable sites.

Vegetation of the cinchona forests of Peru, with palms and tree-ferns. Lindley and Moore : " The Treasure of Botany."

Original forest before felling for clearing the ground for cinchona planting. A path cut through it.

Sowing cinchona seed in a nursery line.

706. A series of temperature charts after Rogers, showing the result of quinine treatment.

A series of exhibits demonstrating the production of quinine and Cinchona febrifuge. Samples of Cinchona preparations from Lieut.-Colonel A. Gage :—

707. Cinchona seed.

708. Inflorescence of various species of Cinchona.

709. Cinchona bark on trunk.

710. Ground Cinchona bark.

711. Oil from bark sludge containing the quinine and other alkaloids.

712. Quinine-bearing oil stirred with dilute sulphuric acid.

713. Acid liquors containing the quinine and other alkaloids.

714. Acid liquors treated with alkali to precipitate crude quinine sulphate.

715. Crude quinine sulphate.

716. Purified quinine sulphate.

717. Sulphate of quinine tablets ; $3\frac{1}{2}$ grains in each.

718. Cinchona febrifuge.

719. Cinchona febrifuge tablets ; $3\frac{1}{2}$ grains in each.

720. Residual alkaloids.

721. The wall-case also shows Cinchona and its alkaloids, illustrating various products which are employed in the treatment of malaria.

722. Tablets of " Plasmoquin Compound."

Each 0·01 gm. plasmoquin.
,, 0·125 gm. quinine sulphate.

Manson-Bahr states the clinical results are superior to plasmoquin alone, and the parasitotropic effect upon subtertian infections is increased, whilst the liability to cyanosis is avoided. For benign tertian and quartan malaria : for seven days, two tablets three times daily. Then four courses lasting one week each, with four days' interval, of six tablets daily. For subtertian malaria, the courses should be of five days each, with a four-days' break.

723. In a series of illustrations are shown the methods of injection of quinine and some of the harmful results (abscesses, ulcers, etc.). These are illustrated in two specimens. Badly prepared tablets may not be absorbed, as is seen in the tablets recovered from the stool of a man who was said to have quinine-resisting parasites.

724. A coloured drawing is shown to illustrate cyanosis resulting from treatment with plasmoquin.

725. An exhibit of Java Cinchona is shown illustrating the following varieties :—

Cinchona Ledgeriana.

Cinchona Ledgeriana.

Cinchona succirubra.

Cinchona hybrid *(Ledgeriana × succirubra ?)*

Cinchona hybrid *(Ledgeriana × succirubra ?)*

Cinchona succirubra (Pavon).

726. (*a*) Crude quinine from urine of malaria patient.

(*b*) Pure quinine base prepared from (*a*).

(*c*) Quinine hydrochloride prepared from (*b*). Presented by Professor J. G. Thomson.

727. Section of muscle showing necrosis due to intramuscular injections of quinine. Presented by Prof. Leonard S. Dudgeon, C.M.G., C.B.E.

728. Necrosis of gluteus maximus due to intramuscular injections of quinine. Presented by Prof. Leonard S. Dudgeon, C.M.G., C.B.E.

VII.—PROPHYLAXIS

729. Summary :—

The key-note to the spread and prevention of malaria is the incidence of breeding-places for the Anopheline carriers of infection.

Three stages in the life-history of Anophelines are spent in water : the egg, the larval and the pupal stages. By a careful study of the bionomics of Anopheline mosquitoes, it is possible to establish rational preventive measures, but it is essential that such investigations should be adjusted to the locality ; the habits of various species vary considerably, and financial considerations indicate measures which are directed against the *known* carriers of disease in the district.

Many methods of prevention are possible and careful selection must be made in accordance with local requirements. The use of larvivorous fish, combined with measures devised to assist their activities, such as removal of weeds, training of streams, etc., is effective in certain areas, whereas elsewhere drainage on a large scale may be indicated. The reclamation of swampy ground has also been found to be a valuable method of prophylaxis. Where such means cannot be adopted, the use of oil, or Paris green, may materially reduce the mosquito population. In any case in heavily infected areas personal prophylaxis with mosquito-nets, veils, gauntlets, mosquito-proof dwellings, etc., must be adopted.

The prophylactic use of quinine is under dispute, but it is probable that its regular use, though it may not prevent infection, at least reduces the incidence of the disease by destroying the parasites in the early stages of their infective activities.

730. A—Measures concerned with infected persons :—

(1) Isolation, mosquito nets, etc.

(2) Treatment.

(3) Anti-relapse measures.

B—Measures concerned with the transmitting mosquitoes :—

The adult insect : Hand-catching, spraying, fumigation, natural enemies—bats and birds.

The aquatic stages. Reclamation of marshland.

Forestry and deforestation.

Urban development.

Drainage :—

Underground drains.

Grouted ditches.

Vertical drainage.

Blind drains (filled with stones).

Open earth ditches.

Control of water by dykes and ditches.

Training of streams.

Re-grading.

Flushing of streams.

Avoidance or supervision of breeding-places produced by man :—

Borrow-pits.

Irrigation channels.

Pools.

Quarries.

Trenches and dug-outs.

Boats.

Barrels.

Broken-down guttering.

Refuse heaps with tins, etc.

Supervision of tree breeding-places :—

Cut bamboos.

Epiphytes.

Large leaves, etc.

Measures to make water unsuitable for breeding :—

Clearing of aquatic vegetation and weeds.

Concrete edging.

Constant agitation of water.

Natural enemies—fish.

To prevent mosquitoes ovipositing :

Screening of receptacles.

Oiling and poisoning :

Paris green, etc.

The Susceptible Person.

Maintain general health. Avoid undue exposure, fatigue, etc.
Segregation of infected natives.
Nets, gauntlets, etc.
Screened houses.
Quinine prophylaxis.

731. A series of paintings illustrate the various methods of prophylaxis :—

Education.
Investigation to discover breeding-grounds.
Patient protected by mosquito net.
Removing undergrowth.
Fumigation to destroy mosquitoes.
Destruction of mosquitoes—traps.
Oiling ponds.
Stocking water with larvivorous fish.
Training streams.
Flushing of streams.
Filling in swampy plain.
Road-making.
Screening water-tubs.
Repairing guttering.
Mosquito net.
Mosquito-proof dwellings.

Natural Enemies.

732. A series of paintings, photographs and half-tone reproductions illustrate the natural enemies of mosquitoes. The most important of these are the larvivorous fish of which many specimens are shown :—

733. Sticklebacks—of value for fighting against salt-water breeding mosquitoes. Presented by Surgeon-Commander David Given, R.N.

734. Shrimps—of value for fighting against salt-water breeding mosquitoes. Presented by Surgeon-Commander David Given, R.N.

735. *Haplochilus bifasciatus* Stdr. Larvivorous fish from the Anglo-Egyptian Sudan. Presented by Major R. G. Archibald, D.S.O., R.A.M.C.

736. *Haplochilus kingi* Boul. Larvivorous fish from the Anglo-Egyptian Sudan. Presented by Major R. G. Archibald, D.S.O., R.A.M.C.

737. *Haplochilus marni* Stdr. Larvivorous fish from the Anglo-Egyptian Sudan. Presented by Major R. G. Archibald, D.S.O., R.A.M.C.

738. *Haplochilus playfairi.* From Zanzibar. These fish eat mosquito larvæ and are of great use against Anophelines. Presented by Dr. W. Mansfield-Aders.

739. *Tilapia melanopleura.* Larvivorous fish from the Gold Coast. Presented by Dr. J. F. Corson, D.T.M. & H.

740. *Haplochilus sexfasciatus.* Larvivorous fish from the Gold Coast. Presented by Dr. J. F. Corson, D.T.M. & H.

741. *Barbus trispilus.* Larvivorous fish from the Gold Coast. Presented by Dr. J. F. Corson, D.T.M. & H.

742. *Barbus ablabes.* Larvivorous fish from the Gold Coast. Presented by Dr. J. F. Corson, D.T.M. & H.

743. *Tilapia zillii.* Larvivorous fish from Sekondi. Presented by Mr. Abbott.

744. *Haplochilus, sp.* Larvivorous fish from Sekondi. Presented by Mr. Abbott.

745. *Mugil falcipinnis.* Larvivorous fish from Sekondi. Presented by Mr. Abbott.

746. *Pseudomugil signifer* Kner. The "Blue Eye." A larvivorous fish from Australia. Presented by L. E. Cooling.

747. *Melan. nigrans.* A larvivorous fish :—

748. (1) *Rivulus harti.*

(2) *Girardinus guppyi.*

(3) *Pœcilia unimaculata.* Larvivorous fish.

749. Indian Larvivorous Fish. Presented by the Indian Museum, Calcutta :—

Anabas scandens (Daldorf).
Macrones vittatus (Bloch).
Ophiocephalus gachua (Ham. Buch.).
Panchax panchax (2) (Ham. Buch.).
Trichogaster fasciatus (Bl. Schn.).
Trichogaster fasciatus (Bl. Schn.).
Trichogaster labius (Ham. Buch.).
Ambassis nama (Ham. Buch.).
Ambassis nama (Ham. Buch.).

Ambassis ranga (2) (Ham. Buch.).

Barbus ticto (Ham. Buch.)

Barbus ticto (Ham. Buch.).

Barbus chrysopterus (McClelland).

Nuria danrica (Ham. Buch.).

Badis badis. (Ham. Buch.).

750. *Anabas scandens* (climbing perch). Habitat: Western and Eastern Africa, India and China. Used in anti-mosquito work.

751. *Trichogaster fasciatus.* Habitat: South-Eastern Asia and Africa. Used in anti-mosquito work. These fish are active destroyers of mosquito larvæ and pupæ.

752. *Haplochilus panchax.* Larvivorous fish from Federated Malay States. Caught by Mr. C. N. Maxwell. Presented by Dr. A. R. Wellington.

753. *Haplochilus javanicus.* Larvivorous fish from Federated Malay States. Caught by Mr. C. N. Maxwell. Presented by Dr. A. R. Wellington.

754. *Lebistes reticulatus.* Habitat: the Tropics and sub-tropical regions. Used in anti-mosquito work.

755. *Girardinus reticulatus* ("Millions"). Imported to Guayaquil from Trinidad for anti-stegomyia work. Presented by Dr. Pareja.

756. *Gambusia nicaraguensis.* Known as "Pupos" in Coatepeque and "Quixque" in Mazatenogo, Guatemala. Presented by Dr. John E. Elmendorf, Junior.

757. *Polycentrus schomburghii.* Larvivorous fish from the Pitch Lake, Brighton, Trinidad. From Mr. Urich.

758. *Rivulus harti.* Larvivorous fish from the Pitch Lake, Brighton, Trinidad. Presented by Mr. Urich.

759. *Pœcilopsis lutzi* (Zambucos). From Zacapa, Guatemala. Presented by Dr. John E. Elmendorf, Junior.

760. Three species of larvivorous fish from Honduras :—

Tetragonopterus aeneus (Günth). Characidæ. Locally known as "Billham."

Mollienisia sphenops (Cuv. and Val.).—Cyprinodontidæ. Locally known as "Poopsey."

Cichlasoma otofasciatum (Regan). Cichlidae. Locally known as "Grana."

" Billham " and " Grana " are of value for use in cisterns and vats ; " Poopsey " is too delicate a fish for cisterns, but makes a splendid top minnow for pools, trenches, shallow wells and running streams. Presented by Mr. John Peach.

761. *Fundulus bermudensis.* A larvivorous fish from Bermuda. From Sir Andrew Balfour.

762. Chara, *sp.* Water-weed which is stated to prevent mosquito-breeding. There is considerable doubt as to its efficacy.

763. *Priopis olivaceus.* Larvivorous fish.

DRAINAGE.

764. Illustrations :—

(*a*) " Herring-bone " drainage of swamps.

(*b*) " Herring-bone " drainage of a bog at the out-crop of a hill stream. This valley was, previous to drainage, a profuse breeder of *Anopheles maculipennis.* Presented by Major A. Oliver, R.A.M.C.

General view of ravine showing drainage by concrete and rubble drain, and in the distance subsoil clay pipes being laid in a contour drain. From Dr. A. R. Wellington.

Malaya :—

(*a*) Subsoil pipes emptying into open drain.

(*b*) New type of permanent drain into which subsoil drains discharge. Watson.

Anti-malaria drainage in a rubber estate. A valley with subsoil drains underneath, showing the dams made to break the force of storm water.

Subsoil pipes for laying. Malaya. From Dr. A. R. Wellington.

Central drain and rubble herring-bone lateral drain. From Dr. A. R. Wellington.

Anti-malarial works. Pipe draining at Tapah, Federated Malay States, showing :—

(*a*) The trench, five feet deep ; a shallower depth would result in the pipes becoming blocked by grass roots.

(*b*) Baked clay pipes placed end to end.

(*c*) Palm leaves to cover pipes and prevent the silt from blocking them before the filling solidifies.

(*d*) The banked-up earth which will fill the trench above the layer of palm leaves. Work planned and carried out by Mr. E. D. Kibble, of the Federated Malay States Public Works Department. From Dr. A. R. Wellington.

Anti-malarial work, Kuala Lumpur. Showing blockage of pipes by grass roots, the result of laying pipes less than three feet below the surface. From Dr. A. R. Wellington.

An excellent gang in a soft place. Shows the kinds of spades used. Report of Entomological Department, The New Jersey Agricultural Experiment Station, 1904.

Land cleared of trees ready for ditching with dynamite.

A typical ditch, made with dynamite, through the same character of land as shown in the photograph above. "Malaria and the Engineer." Published by the St. Louis S.W. Railway.

A typical city stream before ditching and clearing of vegetation.

The same stream after ditching and clearing. "Malaria and the Engineer." Published by the St. Louis S.W. Railway.

Machine ditch, showing how the whole sods, 30 × 6 × 10 inches each, are laid in series along the ditch. Report of the Entomological Department, The New Jersey Agricultural Experiment Station, 1904.

Machine-cut ditch, 10″×30″ deep. Darnall, *Journal of the American Medical Association*, September, 1919.

Rear view of the ditching machine, shows how the sod is taken up and drawn to one side. Report of Entomological Department, The New Jersey Agricultural Experiment Station, 1904.

The True ditching machine at work on the Newark Meadow. Report of the Entomological Department, The New Jersey Agricultural Experiment Station, 1904.

A gate to impound water for flushing a ditch. "Empire." Le Prince and Orenstein.

Removal and destruction of larvæ and matted algæ in a ditch by flushing. "Empire." Le Prince and Orenstein.

Kapar drainage scheme. Main drain, with rubber trees on both sides. Watson.

Malaya. Drains in which *Anopheles ludlowi* does not breed. Watson.

A main drain at Klang, with concrete invert and turf. Top sides made in 1902. Watson.

Toro Point drainage system. Upper end of drain No. 4, June, 1911.

Types of drain recommended for anti-malarial work. From Dr. A. R. Wellington.

Concrete drain after construction. Note depth of filling. Report of the Medical Officer of Health, Accra, for the year 1922.

Another portion of drain. Area not completely levelled. Report of the Medical Officer of Health, Accra, for the year 1922.

Tidal gate :—

(*a*) Deep drain rendered possible by tidal gate. Watson.

(*b*) Automatic tidal gate on Carey Island. Watson. Report of the Medical Officer of Health, Accra, for the year 1922.

765. (*a*) Clairfond Marsh, Mauritius, 1908, showing the spleen index.

Explanatory note: Clairfond is 1400 feet above sea-level, and at this time severe malaria was very prevalent in the marsh and surrounding district. Blackwater fever also occurred. Thus, during the first seven weeks of 1908, there were 87 admissions for malaria fever from Vacoas Barracks out of a strength of about 900. These were nearly all virulent subtertian; five of the 87 died, and over 40 of the remainder had to be invalided to England. Distance from the nearest piece of marsh to the nearest barrack-room, 850 yards.

Local carrier—*Anopheles costalis*.

(From "Malarial Investigations," Mauritius. Fowler.)

(*b*) Clairfond Marsh, Mauritius, 1912, showing the spleen index.

Explanatory note: Clairfond Marsh was drained in 1907–1908, at a cost of £2200. In 1912, the "marsh" was represented only by a few well-canalised streams. Both malaria and blackwater fever had absolutely disappeared. None of the troops contracted malaria in Vacoas during 1912–1913–1914.

(From the Sanitary Report, Mauritius Command, 1912. MacArthur.)

766. Malaria Control at Nitrate Plant.

A pond of more than 40 acres at Sheffield, Alabama, drained by a 41-feet vertical shaft. *Engineering News Record*, Vol. 82, No. 15.

766A. Breeding-Places, Mauritius. Ross.

The cause of malaria among the troops in the huts.

This stream was situated at a distance of 400 yards, and formed a most favourable breeding-ground for *Anopheles costalis*.

Indian village in the middle of a marsh, Clairfond, Mauritius.

Spleen rate of children, 96 per cent. Barracks (native), 400 yards distant. Barracks (European), 1000 yards distant. Malaria very prevalent amongst the troops.

A native hut in the same village.

Showing how it was surrounded by marsh. Anopheline larvæ swarmed here.

Anopheline breeding-ground in a Colonial Cantonment, Mauritius.

Part of an old trench fortification and moat near Port Louis, Mauritius.

Anopheles costalis larvæ were swarming among the grass. Malaria very prevalent in the barracks situated about 900 yards away.

Clairfond Marsh in Mauritius, with village near by.

Malaria rife among troops in barracks situated at several hundred yards distance.

Training of Streams

767. A series of photographs dealing with the training of streams :—

Canalised river, Black River District, Mauritius.

Canalised river, Leche Flacq, Mauritius. From Sir Andrew Balfour.

Canalised mill stream, Monastir Swamp. There are pools infected with Anopheles larvæ amongst the reeds alongside the stream. Photo by Capt. Armour, No. 4 Canadian Hospital, Salonica.

Canalising a gravelly and rocky part of a stream. Walls of the canal are built of the stones got by blasting the passage. Presented by Major Archibald Oliver, R.A.M.C.

Anti-malarial operations in the valley between Ramleh and Jerusalem. From Sir Andrew Balfour.

Vegetation removed from the edge of a pond at Bohio.

Removing vegetation from overgrown streams ; matchets are used. Le Prince and Orenstein.

Ditch cleared by hand labour, showing condition two months after removing grass.

Burning grass from side of ditch ; crude oil used as fuel.

Condition of ditch two months after burning. Le Prince and Orenstein.

Drain before being prepared. Presented by Dr. E. de Verteuil.

Preparation of drain to be lined with liquid asphalt. Presented by Dr. E. de Verteuil.

Burning liquid asphalt with sanitary oil spray. Presented by Dr. E. de Verteuil.

Completed drain lined with asphalt, two months after, showing pieces of barrel hoops in position. These are driven in flush with the surface, or removed immediately after burning. Presented by Dr. E. de Verteuil.

Oiling

768. A series of photographs and half-tone illustrations dealing with the process of oiling :—

"Filming" a ditch with paraffin by means of "one-handed" pneumatic sprayer.—*Health*, 5th November, 1921.

Cresol dip over irrigation channel. Mauritius.

Weed-covered reach and pool of the Gerasini stream, to show difficulties in oiling. From Sir Andrew Balfour.

Method of spraying larvicide or oil on pools so as to prevent mosquito production. "Malaria and the Engineer." Published by the St. Louis S. W. Railway.

An automatic oiler for cesspools. Described in the "Annals of Tropical Medicine and Parasitology," Vol. I. By E. H. Ross and H. C. Ross.

Type of oil sprayer and jacket used. Malaria control. A demonstration of its value to railroads based on experience of the St. Louis S. W. Railway Lines.

Spraying oil on a pond that could not be drained. Malaria Control. A demonstration of its value to railroads based on experience of the St. Louis S. W. Railway Lines.

Apparatus for oiling under pressure.

Scene on Golden Bridge Pond, showing type of lake margin treated. Reproduced from Public Health Bulletin, No. 156, Washington. (Griffith's Paper).

Oil cart for applying oil to roadside ditches.

Algæ united with oil in mat-like masses. "Empire."

Oiling obstructed streams on cut-over lands.

Field supply tank.

Pack mules, for oil transportation in jungle trails.

The larvicide plant at Ancon.

Application of larvicide or oil by knapsack sprayer. Miraflores.

Oil drip applied to hillside stream.

Oiling of breeding-places along a river bank.

Brush in valley of Pedro Miguel River. Some Isthmian topographical conditions increased the cost of transportation and treatment to several times the initial value of the oil. Le Prince and Orenstein.

Personal Measures

769. A series of photographs dealing with personal prophylaxis :—

Draught from propeller as deterrent to mosquitoes.

Screened cars in railroad construction camp.

Types of screened houses, Culebra.

Screened verandahs, Ancon.

A good device to prevent the sagging of screened doors.

Diagrams showing best locations for screen doors.

Screened vestibule door.

Types of screened houses, Colon Hospital Grounds.

Bungalow showing mosquito protection, Araujo. A prophylaxia Rural no Estado do Parana.

Railway windows and doors screened to keep out mosquitoes. "Malaria and the Engineer."

The non-inflammable "mosquinette" with smoker.

Shorts with flaps for protecting knees.

Mosquito net for head and neck. Brighton, Trinidad, near Pitch Lake. Dr. George.

Mosquito boots.

Gloves for protection of wrists and arms.

Mosquito net with canvas protection to lower part.

Another form of net for head protection.

Mosquito protection, showing gauntlets, flaps to shorts and hood.

Mosquito net for head and neck. Brighton, Trinidad, near Pitch Lake.

Prevention of Malaria. The mosquito net properly fitted up.

Mosquito net hammocks, Upper Orinoco. Hamilton Rice.

Mosquito-proofing hammock. Padwick. *Journal of the Royal Naval Medical Service*, April, 1922.

Issue of prophylactic and curative quinine to refugees from Asia Minor. Salonica.

Quinine prophylaxis card as used in Salonica.

Buffalo stable for protecting human dwellings from anopheline invasion. Schüffner. *Report of the Dutch Indian Medical Civil Service.*

Anti-malarial work, Tapah, Federated Malay States. From Dr. A. R. Wellington.

Prince Boris' Tent. Dr. J. A. Turner. Presented by Dr. Newnham, C.M.G.

A coolie "range" showing the water barrels; they are all screened. Sugar Plantation, Diamond, Demerara.

A properly screened water barrel on Plantation Diamond, British Guiana.

Yards in Leopold Street, Georgetown, Demerara, showing wooden vats. Boyce, "Mosquito or Man?"

Water barrel screened with mosquito-proof wire. Inexpensive and efficient. Dickson.

Water storm board, replacing gutter. Civil Prison, Port Louis.

Cleaning cots for labourers, Camp Rio Grande.

Stations on railway between Tiflis and Baku showing malaria towers. From Dr. C. M. Wenyon, C.M.G., C.B.E., F.R.S.

Protected fountain. Turner, "Sanitation in India."

Street "stand-pipe," showing benching. "Tropical Sanitation."

The Uses of Paris Green in Malaria

770. Photographs presented by Dr. L. W. Hackett.

Use of a boat in treating large areas of aquatic vegetation with Paris green larvicide. Ditches can be treated as fast as a man can walk.

Knapsack blower used for dusting water surfaces with Paris green larvicide mixture.

Apparatus for mixing road grit and Paris green.

Consists of double cylinder of wire-screen, the inner cylinder of heavy iron-wire and coarse mesh, the outer cylinder of fine copper screen, diameter 24 cm. Length of the cylinder 55 cm. over all; it revolves on a central axle, one end being placed 3 cm. higher than the other.

Typical method of spreading Paris green mixed with road dust as a larvicide.

Apparatus for sifting road-dust or other materials to mix with Paris green for use with blowers.

Marshes and extensive water surfaces may be dusted by hand.

Knapsack sprayer for larvicidal mixture.

Apparatus for sifting road grit for mixing with Paris green.

Knapsack sprayer for larvicidal mixture.

Exhibits Dealing with Preventive Measures

771. Mosquito-catching tube. Presented by Dr. L. W. Hackett.

772. Special apparatus invented by Dr. Hackett for staining blood films in bulk. Presented by Dr. L. W. Hackett.

773. Glass receptacle for catching mosquitoes. Presented by Dr. L. W. Hackett.

774. Special form of dipper for collecting mosquito larvæ, used by Dr. Hackett in his anti-malarial work in Italy. Presented by Dr. L. W. Hackett.

Paris Green

775. Crude road dust.

776. Screened road dust.

777. Paris green.

778. Larvicide mixture.

779. Bellows for spraying Paris green.

EXHIBITS FROM THE
WELLCOME HISTORICAL MEDICAL MUSEUM

SPECIMENS OF CINCHONA BARKS

780. Cinchona Bark. A specimen brought from Peru by La Condamine in 1738. From M. Lesure.

781. *Quina Loxa.*

Specimens of the first consignment of bark sent from Peru, by Ruiz and Pavon, by the expedition despatched by Charles III of Spain in 1777. From Excmo. Señor Dr. Don Martin y Bayod, The Royal Pharmacy, Madrid.

782. *Quina Calisaya.*

Specimens of the first consignment of bark sent from Peru, by Ruiz and Pavon, by the expedition despatched by Charles III of Spain in 1777. From Excmo. Señor Dr. Don Martin y Bayod. The Royal Pharmacy, Madrid.

THE SPECIMENS OF CINCHONA BARK ARRANGED by M. GUIBOURT for the preparation of his book "HISTOIRE DES DROGUES," 1836

783. *Quinquina nova.* Spurious red bark.
784. *Quinquina nova colorada.* Spurious red bark.
785. *Quinquina piton.* Piton bark.
786. *Quinquina bicolore. Cinchona bicolorata,* Brera.
787. *Quinquina Calisaya* en petites écorces. Quilled yellow bark.
788. *Quinquina Calisaya* en grandes écorces. Quilled yellow bark.
789. *Quinquina Calisaya* mondé. Flat yellow bark.
790. *Quinquina Calisaya* de Plancha. Flat yellow bark.
791. *Quinquina Huamalies Fin.* Rusty crown bark.
792. *Quinquina Huamalies Moyen.* Rusty crown bark.
793. *Quinquina Huamalies Verruquex.* Rusty bark.
794. *Quinquina Huamalies compacte.* Rusty bark.
795. *Quinquina Huamalies Ferrugineux.* Rusty bark.
796. *Quinquina gris-brun de Loxa.* Crown bark.
797. *Quinquina brun de Loxa.* Spurious Crown bark.
798. *Quinquina de Loxa cendre.* Ash bark.
799. *Quinquina de Loxa fibreux.* Crown bark.
800. *Quinquina de Lima moyen.* Grey, Silver, or Huanuco bark.

801. *Quinquina gros de Lima.* Grey, Silver, or Huanuco bark.
802. *Quinquina jaune-orange.* Spurious yellow bark.
803. *Quina Pitaya.* Pitaya bark.
804. *Quinquina de la Colombie ligneux.* Woody Carthagena bark.
805. *Quinquina de Carthagène spongieux.* New spurious yellow bark, Pereira.
806. *Quinquina blanc de Loxa.* Ash bark (?).
807. *Quinquina de Carthagène jaune.* Hard Carthagena bark.
808. *Quinquina de Cuzco.* China Rubiginosa, von Bergen.

CINCHONA BARKS named by H. WEDDELL and formerly in the collection of J. E. HOWARD

809. *Cinchona Calisaya. Cascarilla Naranjada,* Bolivia. Yellow Bark. From *Cinchona Calisaya.*
810. *Cinchona boliviana. Calisaya Morado,* Bolivia. *Calisaya verde Morado,* Peru. Yellow Bark. From *Cinchona boliviana* (Weddell).
811. *Cinchona Calisaya. Cascarilla Calisaya* Canute, Span. Quilled Yellow Bark. Finest Monopoly B. 1849. From *Cinchona Calisaya* a. *vera.*
812. *Cinchona Calisaya.* Ichu Cascarilla, *Cascarilla del Pajonal,* Bolivia. Quilled Yellow Bark. From *Cinchona Calisaya. B. Josephiana.*
813. *Cinchona Condaminea. Cascarilla fina de Uritusinga,* Peru. Crown Bark. Bark of *Cinchona Condaminea* a. *vera.*
814. *Cinchona Condaminea.* Red variety of *Cascarilla Naranjada,* Bogota. Red Carthagena Bark. From *Cinchona Condaminea* a. *lancifolia.* (*Cinchona lancifolia* [Mutis]).
815. *Cinchona glandulifera. Cascarilla Negrilla,* Peru. Not named in English commerce. From *Cinchona glandulifera.*
816. *Cinchona ovata. Cascarilla Palida* (Ruiz, Quinol. 74). Ash Bark. False Loxa Bark. From *Cinchona ovata* a. *vulgaris.*
817. *Cinchona micrantha. Cascarilla Provinciana,* Huanuco. *Cinchona Motosolo,* Carabaya. Quepo Cascarilla, vel *Cascarilla verde,* Bolivia. Silver Bark. Huanuco Bark. From *Cinchona micrantha* a. *rotundifolia. B. oblongifolia.*
818. *Cinchona oblongifolia* (Mutis). *Cascarilla Boba,* Peru. *Cinchona Nova Europæorum.* Red Bark of Bogota. Spurious Red Bark. From *Cascarilla magnifolia* (Weddell).
819. *Cinchona ovata. Cascarilla Carabaya,* Peru. *Cinchona Zamba,* Morado. Carabaya Bark. From *Cinchona ovata. B. rufinervis.*
820. *Cinchona ovata. Cascarilla Carabaya,* var. *Samba,* Peru. Carabaya Bark. From *Cinchona ovata,* var. *rufinervis.*

821. *Cinchona scrobiculata. Cascarilla colorada del Cuzco* (Tabla). Red Cuzco Bark. From *Cinchona scrobiculata* a. *genuia.*

822. *Cinchona Condaminea. Cascarilla Naranjada* (Mutis) and in Colombia. Caqueta Bark. Coquetta Bark. Carthagena Bark. From *Cinchona Condaminea* a. *lancifolia* (Weddell). *Cinchona lancifolia* (Mutis). Added by Dr. Pereira, in 1852, to Mr. Howard's collection.

823. Crown Bark of London Commerce in 1870, from *Cinchona officinalis.*

"Samples of Cinchona Bark, distinguished according to their value for making Quina"

824. Bark containing "Cinchonia, and perhaps a little Quina."
825. Sulphate of Cinchonia, "with the bark which produced it."
826. Bark containing Cinchonia.
827. Bark containing scarcely any Cinchonia or Quina.
828. Spurious Yellow Bark, poor in Quina.
829. Yellow Bark, sea-damaged.
830. Cinchona Bark, country-damaged.
831. Inferior Yellow Bark, yields much of a tar-like substance containing Quina.
832. Nondescript South American Bark; contains Quina in considerable quantity.
833. Spurious Yellow Bark, very poor in Quina.
834. Flat Yellow Bark, very good.
835. Flat Yellow Bark, imported in 1832, rich in Quina.
836. Quilled Yellow Bark; contains the largest quantity of Quina of all the samples.
837. Flat and Quilled Yellow Bark, from one package; good for Quina.
838. Flat Yellow Bark, good; rich in Quina.
839. Flat Yellow Bark, of average quality.
840. Inferior Bark, rough-coated; contains very little Quina.

Other Specimens of Cinchona Bark

841. Ash Bark. *Quinquina de Loxa cendre* (Guib.). China Jaën, Berg. From *Cinchona ovata* (Ruiz et Pavon).

842. Ash Bark. *Quinquina de Loxa cendre* (Guib.). China Jaën, Berg. From *Cinchona ovata* (Ruiz et Pavon).

843. Orange Bark. *Quinquina de Carthagène spongieux* (Guib.). *Cascarilla Naranjada* (Mutis). From *Cinchona lancifolia* (Mutis).

844. Cuzco Bark. *Quinquina de Cuzco* (Guib.). (?) From *Cinchona pubescens* (Vahl).

845. Quilled Red Bark. From *Cinchona succirubra* (Pavon). Grown at Darjeeling, Upper India. From the first consignment sold in open market, at London, in 1870.

846. Crown Bark. *Cinchona officinalis.* Darjeeling. Mr. Jaffrey. Grown at Darjeeling, Upper India. Crop of 1873.

847. *Cinchona dichotoma.*

848. Woody fibres of Yellow Cinchona Bark ; by trituration.

849. Bark of the *Cinchona lancifolia.*

850. Crown Bark. *Cinchona Condaminea.*

851. *Cinchona Flavæ Cortex* ; *Cinchona Calisaya.*

852. *Cinchona lancifolia* (Mutis). *Calisaya de Santa Fé,* described by Delondre and Bouchardat. Presented by Delondre and Bouchardat. *(Signed)* E. Howard.

853. *Cinchona nova.*

Specimen of Native Substitute for Quinine, locally known as Contrebo. From Dr. G. H. Lewis, British Honduras, Central America, 30th August, 1922.

854. Cinchona Bark.

At one time in Dr. Rutherford's possession.

Specimens of the Cinchona Barks of British Commerce

855. Flat Red Bark. *Quinquina rouge non verruqueux* (Guib.). *China rubra* (Berg.). From *Cinchona succirubra* (Ruiz and Pavon).

856. Huanuco Bark. *Quinquina gros de Lima* (Guib.). *China Huanuco* (Berg.). From *Cinchona micrantha* (Ruiz and Pavon).

857. Huanuco Bark. *Quinquina moyen de Lima* (Guib.). *China Huanuco* (Berg.). From *Cinchona micrantha* (Ruiz and Pavon).

858. Flat Yellow Bark. *Quinquina Calisaya de plancha* (Guib.). *China Regia* (Berg.). From *Cinchona Calisaya* (Weddell).

859. Quilled Yellow Bark. *Quinquina Calisaya* (Guib.). *China Regia* (Berg.). From *Cinchona Calisaya* (Weddell).

860. Flat Yellow Bark. *Quinquina Calisaya de plancha* (Guib.). *China Regia* (Berg.). From *Cinchona Calisaya* (Weddell).

861. Crown Bark. *Quinquina de Loxa* (Guib.). *China Loxa* (Berg.). From *Cinchona Condaminea* (Humb. et B.).

862. Rusty Crown Bark. *Quinquina Huamalies fin* (Guib.). *China Huamalies* (Berg.). From *Cinchona purpurea* (Ruiz and Pavon).

863. Flat Red Bark. *Quinquina rouge verruquex* (Guib.). *China rubra* (Berg.). From *Cinchona nitida* (Ruiz and Pavon).

864. Quilled Red Bark. *Quinquina rouge roule* (Guib.). *China rubra* (Berg.). From *Cinchona nitida* (Ruiz and Pavon).

865. Cinchona Bark, from Azogues, near Quito, where it abounds. It resembles Crown Bark ; but it yields scarcely any alkaloid. It seems the *Quinquina brun de Loxa* (Guib.). *Quina Pseudo-Loxa* (Berg.).

866. Spurious Crown Bark. *Quinquina brun de Loxa* (Guib.). *China Pseudo-Loxa* (Berg.). From *Cinchona scrobiculata* (Humb. et B.).

867. *Cinchona, sp.*, from St. Thomé ; West Central Africa.

Alkaloids, etc.

868. Pelletier's Original Specimens of Quinine and Cinchonine, which he discovered in collaboration with Caventou in 1827.

869. Sample of Quinine Pill in official envelope, as sold by the Medical Department of Jamaica for the benefit of natives.

Linnæan Material

872–884 are Facsimiles from the Linnean Society

870. Linnæus, Carl von, 1707–1778. Portrait in oils.

After taking degree of M.D., spent two years in Amsterdam, arranging plants, library, etc. Returned to Stockholm, practised medicine, and originated his binomial nomenclature in natural history.

871. Linnæus, Carl von, 1707–1778. Engraved portrait by Meyer, from painting by Hollman, 1806.

872. Linnæus, Carl von, 1707–1778. Portrait after the original by Krafft, at the Royal Academy of Sciences, Stockholm.

873. ***Cinchona officinalis.*** Type Specimen *(see Frontispiece)*.

874. Autograph Letters from José Celestino Mutis to Linnæus ; facsimiles of portions containing references to Cinchona.

(*a*) 24th September, 1764.

(*b*) 3rd October, 1767.

(*c*) 15th May, 1770.

(*d*) 6th June, 1773.

(*e*) 8th February, 1777.

875. *Cinchona peruviana.*

Drawing in water-colour. Sent by Mutis with his letter of 24th Sept., 1764, to Linnæus. The letter, dated from Santa Fé de Bogota, states:—

"But that my present letter may not seem entirely unprofitable, I send you a figure, with some of the flowers of the Peruvian Bark. I am not certain whether the celebrated Monsieur de la Condamine has given any figure along with his description, nor whether you have had an opportunity of examining a dried specimen, as I find no mark indicative of this in the generic description of Chinchona in your Stockholm edition of 1754."

876. *Cinchona peruviana.*

Two photographs of plant specimens, also sent to Linnæus by Mutis, with the letter quoted above.

877. "Systema Naturæ," by C. Linnæus. 2nd edition, 1740.

Copy annotated by the author. Facsimile of page 19, showing the earliest known reference to Cinchona *(Quinquina Cond.)* by Linnæus.

878. "Genera Plantarum," by C. Linnæus. 2nd edition, 1742.

Facsimile of page 527, showing earliest printed reference to Cinchona in the works of Linnæus. It forms the last item in the Addenda to this volume.

879. "Systema Naturæ," by C. Linnæus. 6th edition, 1748.

Facsimile of page 90, showing the reference to "1021 . . Cinchona."

880. "Materia Medica," by C. Linnæus. 1749. Vol. I.

Interleaved copy annotated in the author's own handwriting. Facsimile of page 24, No. 71. "Cinchona, Quinquina. *Condam. Act.* Paris, 1738," etc., together with the manuscript notes on the leaf facing page 14. These contain historical and bibliographical notes by Linnæus on Cinchona, and in the left-hand margin is written the appellation *Cinchona officinalis*, probably the earliest record of the species *officinalis*.

881. "Species Plantarum," by C. Linnæus. 1st edition, 1753, Vol. I.

Facsimile of page 172, showing printed reference to *Cinchona officinalis*.

882. "Genera Plantarum," by C. Linnæus. 5th edition, 1754.

Facsimile of page 79, showing reference to "208 Cinchona, Quinquina. *Condamin. Act. Gall.*, 1738."

883. "Systema Naturæ," by C. Linnæus. (?) 9th edition, 1756.

Facsimile of page 97, showing reference to "208 Cinchona."

884. "Genera Plantarum," by C. Linnæus. 6th edition, 1764.

(*a*) Facsimile of page 91, on which occurs the spelling "Cinhona."

(*b*) Facsimile of the "Errata" at the end of the book, showing that the error was corrected by the entry "228 Cinhona . . . lege . . . cinchona."

Paintings and Engravings

885. Three frescoes at the Hospital of Santa Spirito, Rome, illustrating the early history of Cinchona, in exact facsimile :—
   (*a*) The Spaniards at Loxa trading with the Indians for supplies of the bark.
   (*b*) The cure of the Countess of Chinchon.
   (*c*) Cardinal Juan de Lugo distributing the febrifuge to the poor of Rome.

886. Susruta. The early Indian physician (*circa* 600 B.C.) "expounds his theory of malarial infection, which he ascribed to bites by mosquitoes."

887. The Discovery of Quinine. An oil painting. P. J. Pelletier and J. B. Caventou in their laboratory, 1820.

Portraits

888. Harvey, Gideon, M.D., *ca.* 1640–1700. Oil painting.
   Author of "The Conclave of Physicians with a Discourse of the Jesuits' Bark," 1683.

889. Sydenham, Thomas, M.D., 1624–1689. Oil painting.

890. Sydenham, Thomas, M.D. 1624–1689. Oil painting.

891. Sloane, Sir Hans, M.D. 1660–1753. Oil painting.
   Donor of the Chelsea Physic Garden to Society of Apothecaries, where John Evelyn saw the Cinchona tree growing in 1685.

892. Mutis, José Celestino, 1732-1808. Oil painting, after the original in the Royal Botanic Gardens, Madrid.

893. Caventou, J. B., 1795–1877. Oil painting, after the original in the Ecole de Pharmacie, Paris.

894. Pelletier, P. J., 1788–1842. Oil painting, after the original in the Ecole de Pharmacie, Paris.

895. Manson, Sir Patrick, G.C.M.G., F.R.S., 1844–1922. Oil painting. "The Father of Tropical Medicine." (Blanchard.)

896. Cantlie, Sir James, K.B.E., F.R.C.S., 1851–1926. Oil painting.

897. Wellcome, Dr. Henry S. Oil painting.

898. Harvey, Gideon, M.D., *ca.* 1640–1700.
   (*a*) Engraved by Pierre Philippe, dated 1663.
   (*b*) Engraved by A. Hertochs. *n.d.*

899. Willis, Thomas, M.D., 1621–1675.
   (*a*) Engraved by R. W. *n.d.*
   (*b*) Engraved by G. Vertue, 1742.

900. Lugo, Cardinal Juan de. Engraved, dated 1660.

901. Hoffmann, F. Engraved by J. Haid. *n.d.*
902. de Jussieu, Bernard. Engraved by Ambroise Tardieu. *n.d.*
903. de Jussieu, Bernard. Engraved, anon. *n.d.*
904. de Jussieu, Bernard. Lithograph by G. Englemann. *n.d.*
905. de Jussieu, A. L. Lithograph by Jul. Boilly, 1820.
906. de Jussieu, A. L. Engraved by A. Feart.
907. de Humboldt, Baron F. H. Lithograph by Jul. Boilly, 1821.
908. de Humboldt, Baron F. H. Lithograph by Delpech after Gérard, 1832.
909. de Humboldt, Baron F. H. Lithograph by Delpech. *n.d.*
910. de Humboldt, Baron F. H. Engraved by Ambroise Tardieu. *n.d.*
911. de Humboldt, Baron F. H. Engraved " Publié par Blaisot." *n.d.*
912. Hooker, Sir Joseph Dalton, F.R.S. Engraved by H. Jeam, 1877.
913. Lambert, Aylmer Bourke, F.R.S. Engraved by W. Evans, 1810.
914. Pasteur, Louis. In photogravure.

Photographs

915. *Cinchona globifera.*
Type specimen, with original inscription by Ruiz on the right.
916. *Cinchona lucumæfolia.*
Type specimen, with original inscription by Ruiz on the right.
917. *Cinchona magniflora.*
Type specimen, with original inscription by Ruiz on the left.
918. *Cinchona microphylla.*
Type specimen, with original inscription by Ruiz on the right.
919. *Cinchona stupea.*
Type specimen, with original inscription by Ruiz on the left.
920. *Cinchona hirsuta*, var. *Pillao.*
Herbarium sheet.

921–929 are Facsimiles from the British Museum (Natural History)

921. *Cinchona lucumæfolia, Cinchona Condaminea.* (Humb. and Bonp.).
Type specimen, with Pavon label.
922. *Cinchona Condaminea.*
Type specimen. Pavon label.
923. *Cinchona hirsuta* (Ruiz and Pavon).
Type specimen.
924. *Cinchona stenocarpa.*
Type specimen, with Pavon label.

925. *Cinchona nitida.*
Type specimen, with Pavon label.

926. *Cinchona Condaminea* (Bonpl.).
Type specimen, with Pavon label.

927. *Cinchona micrantha* (Ruiz and Pavon).
Type specimen, with Pavon label.

928. *Cinchona ovata.*
Type specimen, with Pavon label.

929. Eight of the original Wash Drawings of Cinchona Species made by F. L. Bauer, for A. B. Lambert's "Description of the Genus Cinchona," Facsimiles of.

930. Cinchona Tree.
One of the earliest known illustrations; from "Dendographia" of Johnstonus, 1662.

931. Cinchona Leaves and Flowers.
An early illustration, from Nigrisolus "Febris chinæ expugnata," who copied it from "Donzello."

932. *Cinchona Calisaya.*

933. *Cinchona succirubra.*

934. *Cinchona officinalis.*

935. *Cinchona Ledgeriana* (Moëns).

936. "Mercurius Politicus," 16th December, 1658. Advertisement for Jesuits' Bark. Fascimile.

937. Hoffmann, Friedrich, 1660–1742. Portrait.
Born Halle, Saxony. M.D. Jena, 1681. Author of "De Chinæ-chinæ modo operandi . . ." 1694. Visited England.

938. Jussieu, Antoine de, 1686–1758. Portrait.
Studied medicine at Montpellier. Chief of Royal Gardens, Paris, 1708

939. La Condamine, Charles Marie de, 1701–1774. Portrait.
Went on expedition to Peru, 1736. Member of Royal Society, London. Author of the famous article on "Quinquina" which appeared in *Mém. de l'Acad. royale des Sciences*, 1738. It was La Condamine who first sent specimens of Cinchona to Linnæus.

940. Mutis, Don José Celestino, 1732–1808. Portrait.
Member of Academy of Science, Stockholm. Sent out by Spanish Government in 1761. Worked for forty years on his "La Grande Flore de la Nouvelle Granada." In 1790, placed in charge of Government School of Botany at Santa Fé.

941. Ruiz, Don Hipolito, 1754–1815. Portrait.

Native of New Grenada. Sailed from Cadiz in 1777 with Pavon, on the Botanical Expedition to the Andes and Peru by command of Charles III of Spain. Published "Quinologia" in 1792, and a "Supplément à la Quinologia," jointly with Pavon, in 1801.

942. Caldas, Francisco José de, 1770–1816. Portrait.

Joined Mutis during his expedition. Wrote a paper against the use of Quina, to which Ruiz replied.

943. Lambert, Aylmer B., 1761–1842. Portrait.

Educated St. Mary's Hall, Oxford, 1779. F.L.S., 1788; Vice-President, 1796; F.R.S., 1791. Published "Cinchona," 1797; "Pinus," 1803–1829. Second edition, 1832.

944. Spruce, Richard, 1817–1893. Portrait.

Ph.D., Berlin, 1864. In South America, 1849–64. Reported on Cinchona in Parliamentary "Cinchona" Blue Books.

945. Seemann, B., 1825–1871. Portrait.

M.A. and Ph.D. Göttingen. F.L.S., 1852. On H.M.S. "Herald," 1846–51. "Narative," 1853. "Flora Vitiensis," 1865. In Venezuela, 1864. Founded and edited *Bonplandia*, 1853–63, and *Journal of Botany*, 1863–69.

946. Laveran, Charles Louis Alphonse, 1845–1922. Portrait.

In Algeria till 1856. M.D., 1867. 1875, "Traite des Maladies et Epidémies des Armées." Published, 1884, "Traite des fièvres palustres." In 1902, visited fever-stricken districts of La Corse. Nobel Prize, 1906. In charge of Laboratoire des Maladies Tropicales, Paris, 1907–1922.

947. Gorgas, Surgeon-General William C. Portrait.

1854–1920. M.D., 1879; Chief Sanitary Officer of Panama Canal Zone, 1904; Assistant Surgeon-General United States Army, 1903. Chief of the Yellow Fever Commission of the Rockefeller Foundation, 1916.

948. Balfour, Sir Andrew, K.C.M.G. Portrait.

Director, The Wellcome Tropical Research Laboratories, Khartoum, 1902–1913. Director-in-Chief, The Wellcome Bureau of Scientific Research, 1913–1923.

949. Prain, Sir David, C.M.G., C.I.E., M.B., LL.D., F.R.S., F.L.S., F.Z.S., M.R.I.A. Portrait.

Chairman Advisory Council Plant and Animal Products, Imperial Institute.

950. Simpson, Sir William J. R., M.D., D.P.H., F.R.C.P. Portrait.

Emeritus Professor of Hygiene and Public Health, University of London.

951. Hooper, David, LL.D., F.R.S. Portrait.

Quinologist to the Madras Presidency, Government of India, 1884–1897.

952. Chalmers, Dr. Albert J. Portrait.
Director of The Wellcome Tropical Research Laboratories, 1913–1920.

953. Archibald, Major Robert George, C.M.G., D.S.O., M.D. Portrait.
Director of The Wellcome Tropical Research Laboratories since 1920.

953A. Tschirsch, Professor A. Portrait.

954. Memorial Tablet of Sir Joseph Dalton Hooker, O.M., G.C.S.I., M.D., D.C.L., LL.D., etc., at Kew Church. Portrait.
Portrayed in Wedgwood ware are five of Hooker's chief botanical interests, amongst which is a representation of the *Cinchona Calisaya* tree.

955. Collecting Cinchona Bark in the valley of San Juan del Oro.

956. View of a Plantation of *Cinchona Ledgeriana* in Java.

957. *Cinchona succirubra* trees, four years old, at Sikkim.

958. An Indian Cinchona Nursery—picking out seedlings.

959. Cinchona Nursery at Munsong, India, showing young plants of *Cinchona Ledgeriana*.

MANUSCRIPTS

960. Autograph Letter, dated 4th November, 1748, from La Condamine to Monsieur D'Anville of Paris, Geographer Royal, in which he refers to Cinchona.

961. Autograph Letter, dated 18th August, 1759, from La Condamine to Monsieur De Sauvager of Montpellier.

962. Autograph Letter, dated 20th March, 1864, from Dr. J. E. de Vrij to Daniel Hanbury.
This letter is a reply to Hanbury's of 17th February, 1864, for which see the collection loaned by the Pharmaceutical Society of Great Britain.

963. Autograph Letter, dated 15th December, 1864, from Robert Cross to Sir Clements R. Markham, forwarding his report on the work in the Cinchona Forests of Ecuador.

964. An Original Notice, dated September, 1866, by Sir Clements R. Markham, of G. Planchon's work "Des Quinquinas" (English translation in 1866).

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965. The Original "Permit" issued by the Peruvian Minister of Foreign Affairs to Sir Clements R. Markham, to enable him to carry out his work in the Cinchona Forests. The following is a translation :—

MIGUEL DEL CARPIO
Minister of Foreign Affairs for Peru.

As Don Clements B. Markham (*sic*) is going into the interior of the Republic to fulfil a scientific commission which has been confided to him by his Britannic Majesty's Government,

THEREFORE I order and command the national authorities to give to the said Señor Markham any help he may require and to treat him with the consideration due to his important commission.

Given at Lima, the 23rd of February, 1870.

(Signed) Miguel del Carpio.

966. Autograph Letter (undated) from W. J. Hooker to Sir Clements R. Markham, regarding two species of Cinchona found in British Guiana.

967. Manuscript of "Historia de los Arboles de Quina, Obra Postuma del D. D. José Celestino Mutis," 1809, in the Royal Botanic Gardens of Madrid.

(*a*) Facsimile of Title Page.

(*b*) Facsimile of page 29.

(*c*) Reproduction of Plate V. A. *Cinchona lancifolia.*

(*d*) Reproduction of Plate XI. A. *Cinchona lancifolia.*

(*e*) Reproduction of Plate XVI. A. *Cinchona cordifolia.*

(*f*) Reproduction of Plate XX. A. *Cinchona cordifolia.*

(*g*) Reproduction of Plate XXVII. E. *Cinchona ovalifolia.*

The original plates of this work consist of over one hundred hand-painted designs of various species of Cinchona.

968. Medical Case-Book of John Metford, M.D., of Northampton, 1656. Entry showing the earliest known reference to the use of Cinchona in England. Facsimile.

969. "First Notes on Cinchona of the Pharmacy of S. Maria Novella of Florence." Facsimile.

970. Manuscript Notes of Francesca Redi (1626–97), to have a supply of Cinchona sent to the Oblate Convent of his sister, where it was sold. Facsimile.

971. Record Books of the Royal Pharmacy at Madrid, dealing with the receipt and distribution of Cinchona Bark from Peru :—

(*a*) Libro de data de la Quina del Peru, 1770–1808.

(*b*) Libro de cargo de la Quina que viene del Reyno del Peru, 1785–1807.

Facsimiles of entries.

972. Autograph Letter by Dr. Lopez concerning the Quina of Colombia. Facsimile.

973. Certificates reporting the virtues of the bark from the Jesuit Pharmacy of St. Ignatius, Rome. Facsimile.

974–985 ARE FACSIMILES FROM THE BRITISH MUSEUM (NATURAL HISTORY)

974. Manuscript of "Compendio historico-medico-comercial de las Quinas," by Don Hipolito Ruiz Lopez. Facsimile of page 1.

975. Manuscript of "Instrucion sobre las Quinas," by José Celestino Mutis. Facsimile of pages 1 and 16, the latter showing Mutis' signature.

976. Manuscript of "Reparos y reflexiones criticas sobre la Memoria de la Quina," by Don Hipolito Ruiz Lopez. Facsimile of first and last pages.

977. Manuscript of "Experimentos Quimicos sobre las Quinas," 1811, by Don Hipolito Ruiz Lopez. Facsimile of first and last pages.

978. Manuscript of "Causas por que las Calenturas intermitentes no cortandose en los primeros accessos pasan à malignas y contagiosas," by Don Hipolito Ruiz Lopez.

979. Manuscript of "Estampas de Quinas, No. 6," by Don Hipolito Ruiz Lopez.

980. Manuscript of "Razon de las siete especies de Quina," by Don Hipolito Ruiz Lopez. Facsimile of first page.

981. Manuscript of the first draft (or [?] an abstract) of the Holoscript of Ruiz Lopez.

982. Invoice, in Pavon's writing, for part of the Collection of Cinchona Specimens sold by Pavon to Aylmer Bourke Lambert.

983. Descriptions of Plants collected during their expedition to Peru and Chile, 1777–1788, by J. Pavon and H. Ruiz. Facsimile of the descriptions of Cinchonas.

984. Autograph Letter, dated 8th February, 1794, from John Hawkins to Sir Joseph Banks, relating the circumstances in which his engraved plates (dated 1739) were made from Specimens of Cinchona sent by La Condamine to Doctor C. Mortimer, Secretary of the Royal Society.

985. Two Engraved Plates, "Arvore da Quina Quina," by "Johannes Hawkeens," 1739, referred to above.

PRINTED BOOKS

986. Brunaclius, G.: "De Cina Cina seu Pulvere ad Febres syntagma physicologicum." 8vo. Venetiis, 1661.

987. Badus (or Baldus), S.; "Anastasis Corticis Peruviani seu Kina Kinæ defensio contra ventilationem J. J. Chifletti et V. F. Plempii." 4to. Genuae, 1663. *Idem.* 1668.

988. Monginot, D.: "De la guérison des Fièvres par le Quinquina." 12mo. Paris, 1679. English translation under the title of "New Mystery of Physic discovered by curing of Fevers and Ague by Quinquina of Jesuits' Powder," translated from the French of Dr. Belon, with additions. London, 1681.

989. Talbor, Sir. R. "The English remedy, or his wonderful secret for cureing of Agues and Fevers." 18mo. London, 1682.

990. Blegny, N. de. : " Découverte du Remède Anglais pour la guérison des Fièvres," publié par ordre du Roi. 12mo. Lyon, 1680. *Idem.* Paris, 1682.

991. La Fontaine, Jean de : " Poëme sur le Quinquina." 12mo. Paris, 1682.

992. Harvey, Gideon : " The Conclave of Physicians, detecting their intrigues, etc., with a Discourse of the Jesuit's Bark." 12mo. London, 1683.

993. [Anon.] : " Les admirables qualités du Kinkuina, etc." 12mo. Paris, 1689. Ed. alt. 12mo. 1705.

994. Torti, F. : " Therapeutica specialis ad Febres quasdam repente lethales, una verò China China sanabiles." 4to. Mutinæ, 1712.

995. Douglas, J. : " An account of Mortifications and of the surprising effects of bark in putting a stop to their progress." 8vo. London, 1729.

996. Cohausen, J. H. : " Archæus faber Febrium, cum methodo administrandi Corticis Chinæ Chinæ." 8vo. Amsterdam, 1731.

997. Cocchius, A. C. : " Diss. continens vindicias Corticis Peruviani." 8vo. Lugd. Bat., 1750.

998. Torti, F. : " Responsiones iatro-apologeticæ de abusu Chinæ Chinæ." 8vo. Mutinæ, 1756.

999. Huth, G. L. : " Sammlung verschiedener die Fieber-rinde betreffender Abhandlungen und Nachrichten." 8vo. Nürnberg, 1760.

1000. Benescia, G. B. : " Viva idea del efficacia della China China." 8vo. Livorno, 1761.

1001. Alcinet, J. : " Nuevas utilidades de la China." 4to. Madrid, 1763.

1002. Bousquet, —. : " Diss. sur l'abus du Quinquina." 8vo. Stockholm, 1766.

1003. Capell, J. A. : " De Cortice Peruviano." 12mo. Viennæ, 1766.

1004. Held, C. A. : " De tempestivo Corticis Peruviani usu in Febribus Inflammatoriis." 4to. Gottingæ, 1775.

1005. Vastpanus, P. J. : " De China China in Synochis putribus animadversiones." 8vo. Taurini, 1779. *Idem.* Argentorati, 1783.

1006. Saunders, W. : " Observations on the superior efficacy of the Red Peruvian Bark in the cure of Agues and other Fevers, interspersed with occasional remarks on the treatment of other diseases by the same remedy." 8vo. London, 1782.

1007. Rigby, E. : " Essay on the use of the Red Peruvian Bark in Intermittents." 8vo. London, 1783.

1008. Fothergill, John : " On the use of Cortex Peruvianus in Scrophular diseases. In vol. iii of his collected works, edited by Lettsom." 8vo. London, 1783.

1009. Kentish, R.: "Experiments and Observations on a New Species of Bark, showing its great efficacy in very small doses; also a comparative view of the powers of the Red and Quilled Bark; being an attempt towards a general analysis and compendious history of the valuable genus Cinchona or the Peruvian Bark." 8vo. London, 1784.

1010. Skeete, T.: "Experiments and Observations on the Quilled and Red Peruvian Bark, among which are included some remarkable effects arising from the action of common Bark and Magnesia upon each other; with remarks on the action and mode of treatment of Fevers, putrid Sore Throat, Rheumatism, Scrophula and other diseases, in order to ascertain the cases in which Bark may be administered, either alone or combined with other remedies, to the best advantage." 8vo. London, 1786. German translation. 8vo. Leipzig, 1787.

1011. Baumes, M.: "De l'usage du Quinquina dans les Fièvres Rémittentes." 8vo. Paris, 1790.

1012. Relph, J.: "An inquiry into the medical efficacy of a new species of Peruvian Bark lately imported into this country under the name of Yellow Bark, including practical observations respecting the choice of Bark in general." 8vo. London, 1794. German translation by F. G. Friese. 8vo. Berlin, 1797.

1013. Pluquet, F.: "Nouvelles recherches sur le Quinquina." 8vo. Paris, 1808.

1014. Laubert, C. J.: "Recherches botaniques, chimiques, pharmaceutiques sur le Quinquina." 8vo. Paris, 1816.

1015. Lambert, A. B.: "An Illustration of the genus *Cinchona*, comprising descriptions of all the officinal Peruvian Barks, including several new species." 4to. London, 1821.

1016. Pelletier et Caventou, MM.: "Analyse chimique des Quinquinas suivie d'observations médicales sur l'emploi de la Quinine et de la Cinchonine." 8vo. Paris, 1821.

1017. Sachs, L. W.: "Die China und die Krankheiten welche sie heilt. Ein pharmakolog-therapeutischer Versuch." 8vo. Königsberg, 1831.

1018. Evelyn, John, the Diary of. 8vo edition. London, 1850. Vol. 2.

1019. Briquet, P.: "Traité thérapeutique du Quinquina et de ses préparations." 8vo. Paris, 1853. Deuxième éd. Paris, 1855.

1020. Delondre, A. P., et Bouchardat, A.: "Quinologie. Des Quinquinas et des questions qui dans l'état présent de la science et du commerce s'y rattachent avec le plus d'actualité." 4to. Paris, 1854.

1021. Howard, J. E.: "Illustrations of the Nueva Quinologia of Pavon, with 27 coloured plates of plants and their dissections, by W. Fitch, F.L.S. Three coloured plates, containing 44 delineations of microscopic sections by Tuffen West, F.L.S., and observations on the Barks described by John Eliot Howard, F.L.S." Folio. London, 1862.

1022. van Gorkom, K. W.: "Kina." Haarlem. *n.d.*

1023. von Martius, Dr. C. F. Ph.: "Die Fieber-Rinde, der China-Baum, sein Vorkommen und seine Cultur." *n.d.*

1024. Petit, J. M. Théophile: "De quelques succédanés du Quinquina, dans la traitement de la Fièvre Intermittente." Paris, 1863.

1025. Destouches, Dr. Louis: "Essai sur les Préparations Pharmaceutiques du Quinquina." Paris, 1864.

1026. Markham, Clements R.: "Memoir of the Lady Ana de Osorio, Countess of Chinchona and Vice-Queen of Peru (A.D. 1629–39), with a Plea for the Correct Spelling of the Chinchona Genus." 8vo. London, 1874.

1027. Simon, Jules: "Les Succédanés en Therapeutique; étude comparative de l'action physiologique des quatre principaux alcaloïdes du quinquina: quinine, cinchonine, cinchonidine, quinidine." Paris, 1883.

1028. Dinan, Jules: "Etude sur le Pambotano (Calliandra, Houstoni, *Bentham*) comme Succédané du Quinquina." Paris, 1896.

1029. Reimers, M.-N.: "Les Quinquinas de Culture." Paris, 1900. Autographed by the Author.

1030. Charpentier, J.-B.: "Etude Anatomique et Microchimique des Quinquinas de Culture." Paris, 1900.

1031. Badin, Eugène: "Contribution à l'étude du Dosage des Alcaloïdes totaux des Quinquinas." Lyon, 1906.

1032. La Condamine, C. M. de: "Sur l'arbre du Quinquina." Reprint with Notes, in *Monumenta Pharmaceutica*, Amsterdam, 1914.

1033. Perrot, M. Emile: "Quinquina et Quinine." Paris, 1926.

1034. Cowan, J. M.: "Cinchona in the Empire; progress and prospects of its Cultivation." (*Empire Forestry Journal*, Vol. 8, No. 1). London, 1929.

1035. Departmental Reports and Blue Books, with Manuscript. Annotated by Sir Clements R. Markham. Formerly in his possession.

MAPS

1036. Sketch Map of Southern India, by Sir Clements R. Markham, 1865. Facsimile.

1037. Map of the Cinchona Regions of South America. 1880.

1038. Map illustrating Markham's journey to the Cinchona Forests of Carabaya, Peru, in 1860.

1039. Sketch Map, showing region where Cinchonæ were collected from forests of Carabaya, Peru, 1860.

1040. Map, showing the " Red Bark " region of Ecuador.

1041. Map showing the distribution of Cinchona cultivation.

1042. Map showing the Cinchona regions in South America.

1043. Two tableaux prepared to illustrate the country where Cinchona was discovered, about 1630; and the places trade was carried on after it was introduced.

1044. Massive bronze mortar, and iron pestle, eight feet long. From the Hospital at Santa Cruz, Barcelona, Spain, where it was used for pulverising the Cinchona Bark.

1045. Two XVIIth century boxes (replicas) bearing the labels "Chin. Peruv. Contus" and "Chin. Pitaia," from the Pharmacie della Scala, Rome, together with original specimens of the barks.

1046. Peruvian postage stamps, bearing the national Coat of Arms, including a representation of the Cinchona tree.

1047. Drug jars and containers, etc.

EXHIBITS FROM
THOMAS MORSON & SON, LTD.

1048. Morson, Thomas N. R. Portrait.

A Founder of the Pharmaceutical Society of Great Britain, 1841. President, 1848 and 1859. A Founder of the Chemical Society, 1841.

"He was . . . the first to make sulphate of Quinine and Morphine on a commercial scale in England, and this was in the Old Pharmacy at 65, Fleet Market." (In 1821.)

1049. Price list of fine Chemicals issued in 1821. Facsimile.

1050. "Milestones on the Road of Time." Issued by Thomas Morson & Son, Ltd. *n.d.*

1051. "A Short Account of the Historic House of Morson." Issued by Thomas Morson & Son, Ltd. *n.d.*

EXHIBITS FROM THE
FACULTY OF PHARMACY, UNIVERSITY OF PARIS

1052. Thirty Specimens of Cinchona, ex coll. Delondre.

1053. Ten specimens of Cinchona, ex coll. Guibourt.

1054. Calabash, containing extract of concentrated "Quina."

EXHIBIT FROM
DAVID HOOPER, LL.D.

1055. "Standardisation of Cinchona Febrifuge." Reprinted from the *Quarterly Journal of Pharmacy and Pharmacology*, 1928.

SUPPLEMENTARY CATALOGUE

EXHIBITION

CINCHONA TERCENTENARY CELEBRATION

AT THE

WELLCOME HISTORICAL MEDICAL MUSEUM

ADDITIONAL EXHIBIT FROM

HIS EXCELLENCY THE AMBASSADOR OF SPAIN

1056. The Arms of the Emperor Charles V of Spain, etc.

ADDITIONAL EXHIBITS FROM

PROFESSOR A. TSCHIRCH

(OF THE PHARMACEUTICAL INSTITUTE OF THE UNIVERSITY OF BERNE)

1057. Tschirch, A.: "Cortex Cinchonæ," in his "Handbuch der Pharmacognosie," 1930.

1058. Microscope slides made by Phœbus (Reuling), 1864, "Chinarinden."

ADDITIONAL EXHIBITS FROM

HOWARD & SONS, LTD., ILFORD, LONDON

CINCHONA BARKS FROM JOSÉ PAVON'S COLLECTION

1059. Cascarilla estoposa de Loxa. *Cinchona stupea.*

1060. Cascarilla tarontaron. *Cinchona tarontaron.*

1061. Cascarilla (peluda, *see* Quinologia). *Cinchona undulata.* Estas cortezas las envio Tafala de los montes de Chicoplaya del Peru.

1062. Cascarilla fina provinciana de Quito. Cascarilla crespilla de Jaen (var. de la enterior). Mezcladas.

1063. Cascarilla azahar (macho). *Cinchona ferruginea.*

1064. Cascarilla serrana de Huaranda, Quito. *Cinchona coccinea.*

1065. Quina colorada de Loxa de la Drogueria de Aramburo.

1066. Quina blanca de Mutis. *Cinchona ovalifolia* (Mutis).

1067. Cascarilla con hojas rugosas de Loxa. *Cinchona parabolica.*

1068. Cascarilla de hoja morada la cascarilla Purhon es variedad de la anterior. *Cinchona purpurea.*

1069. Cascarilla cucharilla. *Cinchona viridiflora.*

1070. Cascarilla uñas de gato. Peru. *Cinchona globiflora.*

1071. Cascarilla con hojas de zambo de Loxa. *Cinchona palalbæ* (?).

1072. Quina selectisima de Loxa. *Cinchona Condaminea* (H. et B.) (?) *Cinchona Uritusinga* (Pav.), Quin. (?).

1073. Quiebro de Loxa y de la Prov. de Pau ; cascarilla de Cuenca ; cascarilla de los altos de Hualares, cerro de Tapa ; Quina amarilla de Loxa ; Cinchona caba ; chinchona de hoja redonda. *Cinchona macrocalyx.*

1074. Quina de Calisaya. (Planchuela cortezon y arrollada).

1075. Cascarilla amarilla de Tura y de Chito ; son una misma especie de Quito del comercio de cacaniguas. *Cinchona lurea.*

1076. Cascarilla colorada de Loxa de la prov. de Jaen. *Cinchona conglomerata.*

1077. Cascarilla colorada de Huaranda — Quito. Quina rica. *Cinchona succirubra.*

1078. Cascarilla de Najenal de Loxa. *Cinchona magniflora.*

1079. Cascarilla crespilla con hojas de robles. Loxa. *Cinchona microphylla.*

1080. Cascarilla con hojas de Palton. *Cinchona Palton.*

1081. Verdadera Quina roja (de Mutis). *Cinchona succirubra* (JEH) No. 4.

1082. Esta especie la descubrio Tafalla en el famoso rio Ucayali a la dritta en los bosques de Chicoplaya. Cascarillas *parecida* a la Quina anaranjada de Mutis o sea la *Cinchona lancifolia* de Mutis, o la *Condaminea* de Bonpland, o la *angustifolia* de la Flor. Per.

1083. Cascarilla Chahuarguera ; cascarilla amarilla fina del Rey ; colorada fina del Rey ; crespilla negra parecida a la amarilla fina o buena. Todas de Loxa. *Cinchona Chahuarguera.*

1084. Cascarilla flor de Azahar. Peru. *Cinchona magnifolia* (R. and P.).

1085. Cascarilla Boba pata de gallareta de Huanuco. Peru. *Cinchona ovata.* (R. and P.).

1086. Cascarilla pata de gallinazo 2ª especie de Loxa de buenas virtudes. *Cinchona subcordata.*

1087. Cascarilla blanca pata de gallinazo de Loxa. la. Esp. (Parecida a la Quina Amarilla de Mutis). *Cinchona suberosa.*

1088. Cascarilla suberosa var. Crespilla de Jaen (?).

1089. Crespilla ahumada de Loxa. *Cinchona decurrentifolia.*

1090. *Cinchona Uritusinga.*

1091. Cascarilla negra de Azogues, Loxa. *Cinchona macrophylla.*

1092. Cascarilla fina delgada de Loxa. *Cinchona hirsuta.*

1093. Cascarilla Azaharita.

1094. Quina Amarilla de Mutis y de Don Sebastian Lopez. *Cinchona cordifolia* (Mutis). *Cinchona ovata* (R. and P.).

1095. Cascarilla pata de Gallinazo. 2ª especie de Loxa de buenas virtudes.
1096. Asmoniche del Peru. *Cinchona rosea* (R. and P.).
1097. Cascarilla purhones. Variedad de la anterior.
1098. Cascarilla boba amarilla. *Cinchona lanceolata* (R. and P.).
1099. Cascarilla fina peruana, o la que llaman en el comercio "Quina Una." *Cinchona nitida* (R. and P.).
1100. Cascarilla de Loxa puntiagua. Peru. *Cinchona acutifolia.*
1101. Cinchona ovata affinis (Weddell).
1102. Cinchona cascarilla serrana de Huaranda.

Cinchona Barks from Weddell's Collection

1103. *Gomphosia chlorantha* (Wedd.), 1854. No alkaloid.
1104. *Cinchona Calisaya* (Wedd.). (Calisaya Zamba).
1105. *Cinchona micrantha* (R. and P.). Prov. de Yungas, Bolivia, 1851.
1106. *Cinchona australis* (Wedd.).
1107. *Cinchona cordifolia* (Mutis).
1108. *Cinchona Calisaya verde.* Prov. de Yungas, Bolivia, 1851.
1109. *Cinchona Laplacea quinaderma* (Wedd.).
1110. *Cascarilla magnifolia* (Wedd.). *Cinchona oblongifolia* (Mutis). Prov. de Yungas, Bolivia, 1851.
1111. *Cinchona ovata* (R. and P.), var. *B. rufinervis.*
1112. *Cinchona Condaminea* var. *lancifolia.* "Echantillon fourni par Mutis à MM. Humboldt and Bonpland."
1113. *Cinchona scrobiculata* (R. and P.).
1114. *Cargua-Cargua del Pajonal.* Prov. de Yungas, Bolivia.
1115. *Gomphosia chlorantha.* "Macho cascarilla." (Wedd.).
1116. *Calisaya zambita.* Prov. de Yungas, Bolivia, 1851.
1117. *Cinchona amygdalifolia* (Wedd.).
1118. *Calisaya morada.* Prov. de Laricaja, Bolivia, 1851.
1119. *Cinchona officinalis* from Ceylon. "The first really fine parcel." July, 1871.
1120. *Howardia febrifuga* (Wedd.).
1121. *Cinchona Boliviana* (Wedd.).
1122. *Cinchona ovata* (R. and P.) var. *erythroderma.*
1123. *Cinchona purpurascens* (Wedd.).
1124. Cascarilla Carna (Wedd.).
1125. *Cinchona pubescens* (Vahl).
1126. *Cinchona australis* (Wedd.).
1127. *Cinchona micrantha* (R. and P.).
1128. Cascarilla. "Compare the Colorada de Loxa."

1129. (*Cinchona*) *Pimentelia glomerata* and Cascarilla bullata, "given me by Dr. Weddell, Decr., 1854."

1130. Cascarilla macrocarpa (Wedd.). *Cinchona ovalifolia* (Mutis). "Echantillons provenant J. Mutis."

1131. *Cinchona ovata* (R. and P.) a. *vulgaris*.

1132. *Calisaya morada*. Prov. de Yungas, Bolivia, 1851.

1133. *Cinchona ovata* var. *macrocarpa* (Wedd.), ined.

1134. *Cinchona, sp.*

Cinchona Barks from Dr. C. F. Reichel's Collection

1135. *Chin., sp.* (Berg.) halte für synonym mit *Cinchona Obaldiana* (Howard); *Cinchona Obaldiana* (Klotzsch); *Quinquina micrantha plat.* (Weddell); *China flava sabella* (Schleiden, No. 273), Sammlung Bergen.

1136. Huamalies China, Handelswaare jeder Stärke und Vorkommen, Hamburg, 1824. Sammlung Bergen.

1137. *Cinchona suberosa* (Rz. et Pavon), "häufig unter den Rinden der *Cinch. Delondriana* (Weddell), von Lampe und Kaufmann in Berlin als Königs-China mit Borka abgegeben . . . für welche Species halten Sie die für sich eingeschlagene Rinde?"

1138. *Cinchona micrantha* (Ruiz et Pavon). *Cascarilla provinciana*. Prov. Huanuco Peruviæ, 1829. Poeppig leg. et determ.

1139. Falsche Königs-China von Jobst. "Wofür halten Sie diese Rinde sie ahnelt der *Cinchona scrobiculata* (Humb. et Bonpl.) in Weddell's 'Hist. nat. de Quinquina'."

1140. *Cinchona lancifolia* (Mutis); *Cinchona angustifolia* (R. et Pav.); *Quina Junita* (Lopez); *Quina naranjada* (Mutis); *Quina lancifolia* (Warczewitz, Klotzsch); *Quinquina jeune orange de Mutis* (Delondre et Buschendal); *Quinquina orange de Mutis* (Weddell); *Quinquina Carthagène spurieux* (Guibourt); *Cost. Chinne aurantiarus* (Schleiden) Bogotá. von Warczewitz, Königl. Sammlung in Berlin.

1141. *Cinchona Obaldiana* (Klotzsch). Quina Carmin. St. Fé de Bogotá, Neu Granada; von Warczewitz, 1851.

1142. *China flava* (Berg.). Hamburg, 1831, Sammlung Bergen. Nach Weddell. Hist. natur. de Q. *Cinchona ovata* Flor. Peruviae.

1143. *China Viura* (Berg.). No. 4 Berliner Sammlung. *Quina de Popayan*. Neu Granada; von Warczewitz, 1850.

1144. *Cascarilla boba colorada*. *Cinchona purpurea* (Rz. et Pav.) *Peruviæ Cuchero*, 1829; Poeppig leg. et determ.

1145. *Cascarilla boba colorada Cuchero*, Poeppig, 1829. *Cinchona purpurea* (R. and P.). *Peruviæ Cuchero*, 1829, Poeppig leg. et determinavit e Collect. Reichelii *Cortex China Huamalies*.

1146. *Cinchona micrantha* (Poeppig, Ruiz et Pavon). *Cinchona scrobiculata* (Humb. et Bonpld.); *Cinchona ovata* (Weddell). Schleiden abstammend. Alte starke Huanuco-China (*sic.*) des Handels aus Sammlung Bergen, 1832.

1147. "Ein junges Bäumchen der *Huamalies China* in getheilten Stücken" von *Cinchona purpurea* (R. et Pav.). Sammlung Bergen.

1148. *China rubra* (?). Sammlung Bergen.

1149. *Lima-Loxa China* (Berg.), 1833 aus v. Sammlung Bergen; *Cascarilla negrilla* ordinaria Reichel et Poeppig.

1150. Cort. *Chinae rubrae* in seltnen flachen, starken Stücken und Röhren. Amsterdam, 1826. Sammlung Bergen.

1151. *Huamalies*—artige Königs-China sehr selten starke Rinden, 1826, Amsterdam. Sammlung Bergen; Cort. Chinae de Sta. Anna (Schleiden).

1152. *Quina negrilla*, gathered by Poeppig, marked *C. glandulifera*, Lima-Loxa des Handels; Cuchero, 1829, Poeppig, leg. et determ.

1153. *Quina negrilla*, gathered by Poeppig, marked "*Casc. negrilla ordinaria Cuchero*," 1829, Poeppig; *Cinchona glandulifera* (R. and P.); Poeppig legit. et determ.; *Peruviæ Cuchero*, refert.; *Lima-Loxa* des Handels.

1154. *Cascarilla Pata de Gallinazo* Geierklauer-Rinde. Peru. Cinchonerusalder von Cuchero, 1829. Poeppig.

1155. Graue China; *China Huanuco* in feinen Röhren *China Peruviana* (Ruiz). *Nitida* (Pritchett), 1860; *micrantha* (Reichel), 1857; Rinden von jungen Aesten.

1156. Pato di Gallianazo; *Cinchona micrantha* (R. and P.); Prov. Huanuco per., 1829; Poeppig legit. et. determ. (Lima-Loxa des Handels).

1157. "*Cascarilla provinciana.*" Poeppig legit.; *C. micrantha.* Peru Cinchinerusalder, 1829.

1158. Quina from *Cinchona Calisaya.* The Yellow Bark.

MANUSCRIPTS

1159. An Autograph list of Cinchona barks by Dr. C. F. Reichel.

1160. Autograph Letter, dated 20 June, 1850, from Muséum d'Histoire Naturelle, Paris, to J. E. Howard, concerning a collection of Cinchona barks, presented to the Museum by him.

1161. Autograph Letter, dated 6 July, 1850, from Muséum d'Histoire Naturelle, Paris, to J. E. Howard, concerning a collection of Cinchona barks by Weddell, presented by the Museum to Howard.

1161A. Original Manuscript. *Nueva quinologia*, etc. By José Pavon, 1825.

1161B. Manuscript. "The History of Peruvian Bark." By John Eliot Howard.

1161C. Manuscripts and Documents from the India Office, addressed to John Eliot Howard.

PHOTOGRAPHS

1162. Reichel, Dr. Carl F. Portrait.

1163. Four frames of Leaves of *Cinchona Ledgeriana*, var. *Anglica*. Grown at Tottenham, nr. London, 1881, by John Eliot Howard, F.R.S.

1164. Two Photographs of Cinchona plants grown at Tottenham, nr. London, 1879, by John Eliot Howard, F.R.S.

1165. Sulphate of Quinine extracted from 1 lb. bark of *Cinchona Calisaya*, var. *Anglica*, grown at Tottenham, nr. London, 1875.

EXHIBITS FROM
SIGNOR P. PERETTI, ROME

1166. A ledger of Peretti's pharmacy, Rome, dated, 1823, in which are entries of the method of preparation of quinine salt, the purchase of quinine, pulverisation, price, etc.

1167. Receipt of *Quina Calisaya*. 25th February, 1824.

1168. " Del Dritto Privativo di Vendere China in Polvere," Rome, 1822.

1169. Pamphlet on quina bi-chlorate. Padua, 1825.

1170. Another pamphlet on quina bi-chlorate. Padua, 1825.

1171. MS. of Dr. P. Peretti. Method of Extraction of the Alcaloid.

1172. MS. of Dr. P. Peretti. Preparation of Sulphates of quinine.

1173. MS. of Dr. P. Peretti, on Bitter Substances in Vegetables.

EXHIBITS FROM
DR. CARLO ROSSI, ROME

1174. Price list of Medicines and drugs in Rome, 1674.

1175. Edict of Clemente XII, 1735, prohibiting Monastic Pharmacies from selling medicine.

ADDITIONAL EXHIBITS FROM THE
FACULTY OF PHARMACY, UNIVERSITY OF PARIS

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1176. *Quinquina jaune de Guatemala.*

1177. *Cinchona micrantha* plat.

1178. *Quinquina Huanuco.*

1179. *Cinchona nitida.*
1180. *Quinquina caquetta.*
1181. *Quinquina Huanuco* pâle.
1182. *Quinquina de Loxa* vrai.
1183. *Quinquina Huanuco* rouge.
1184. Wiry Loxa Bark.
1185. *Quinquina* jaune du roi d'Espagne.

DELONDRE COLLECTION.

1186. *Quinquina de Loxa gris fin Negrilla Equateur.*
1187. *Quinquina gris fin Condaminea Equateur.*
1188. *Cinchona lancifolia* (Mutis).
1189. *Quinquina pitayo delle Grenade.*
1190. *Quinquina Calisaya* roulé avec épiderme, Bolivie.
1191. *Cinchona van Mapiri Fijnste.*
1192. *Quinquina Huanuco* roulé avec épiderme.
1193. *Quinquina de Cuzco* brun Pérou.
1194. *Quinquina bicolor Equateur.*
1195. *Cinchona Josephiana* (Wedd.). (Don de M. Reiners).
1196. *Quinquina Carabaya* Pérou.
1197. *Quinquina Carthagena* rose delle Grenade.
1198. *Quinquina blanc.* Delle Grenade.
1199. *Quinquina* rouge de Cuzco. Cinchona Delondriana.
1200. *Quinquina de Cuzco* jaune Pérou.
1201. *Cinchona pubescens. Cinchona robusta* Trimen.
1202. *Quinquina jaune de Guayaquil Equateur.*
1203. *Quinquina rouge de Mutis delle Grenade.*
1204. *Cinchona micrantha* (Ruiz et Pavon).
1205. *Cinchona Pahudiana* (Howard).
1206. *Cinchona pitayensis* (Weddell).
1207. *Cinchona Corola.*
1208. *Calisaya plat sans épiderme,* Bolivie.
1209. *Quinquina jaune orangé* de Mutis.
1210. *Cinchona officinalis Condaminea Loxa Murea.*
1211. *Cinchona cordifolia* (Mutis).
1212. *Cinchona verde.*
1213. *Cinchona officinalis* (Linn.).
1214. *Quinquina rouge pale Equateur.*
1215. *Cinchona succirubra* (Pav.).

ADDITIONAL EXHIBIT FROM THE
SOCIÉTÉ DU TRAITEMENT DES QUINQUINAS, PARIS

1216. Three Specimens of Ancient Cinchona Bark.

ADDITIONAL EXHIBITS FROM THE
WELLCOME HISTORICAL MEDICAL MUSEUM

1217. XVIII Century French Manuscript, entitled " Pharmacologie ou Matière Médicale," containing 20 pages on " Le quin quina."

1218. Official Report of the inspection in the " Taberna Herbaria " of Filippo Meli. Rome, 26th September, 1772.

1219. " Prohibitio " referring to monks practising pharmacy, 1722.

1220. " Prohibitio " of Clemente XII, referring to monks practising pharmacy, 20th July, 1733.

1221. Prescriptions containing china-china, XVII Century. From an old Roman Pharmacy.

1222. Photograph of a plaque of Professor Peter Peretti, 1780–1860. Pupil of Pelletier and inventor of a new method for extracting salts from quinine.

1223. " Le Mirabili Virtu Della Kina Kina." Wansvieten, Venezia, 1785.

1224. Beraudi : " Commentario sulla China China," Milano, 1831.

1225. Celli : " Storia Della Malaria." Rome, 1925.

1226. Grand, F. : " Déterminer si dans le Traitement d'une Fièvre intermittente, etc." Montpellier, 1797.

1227. D'Astros, J. T. L. : " De La Fièvre Pernicieuse." Aix, 1838.

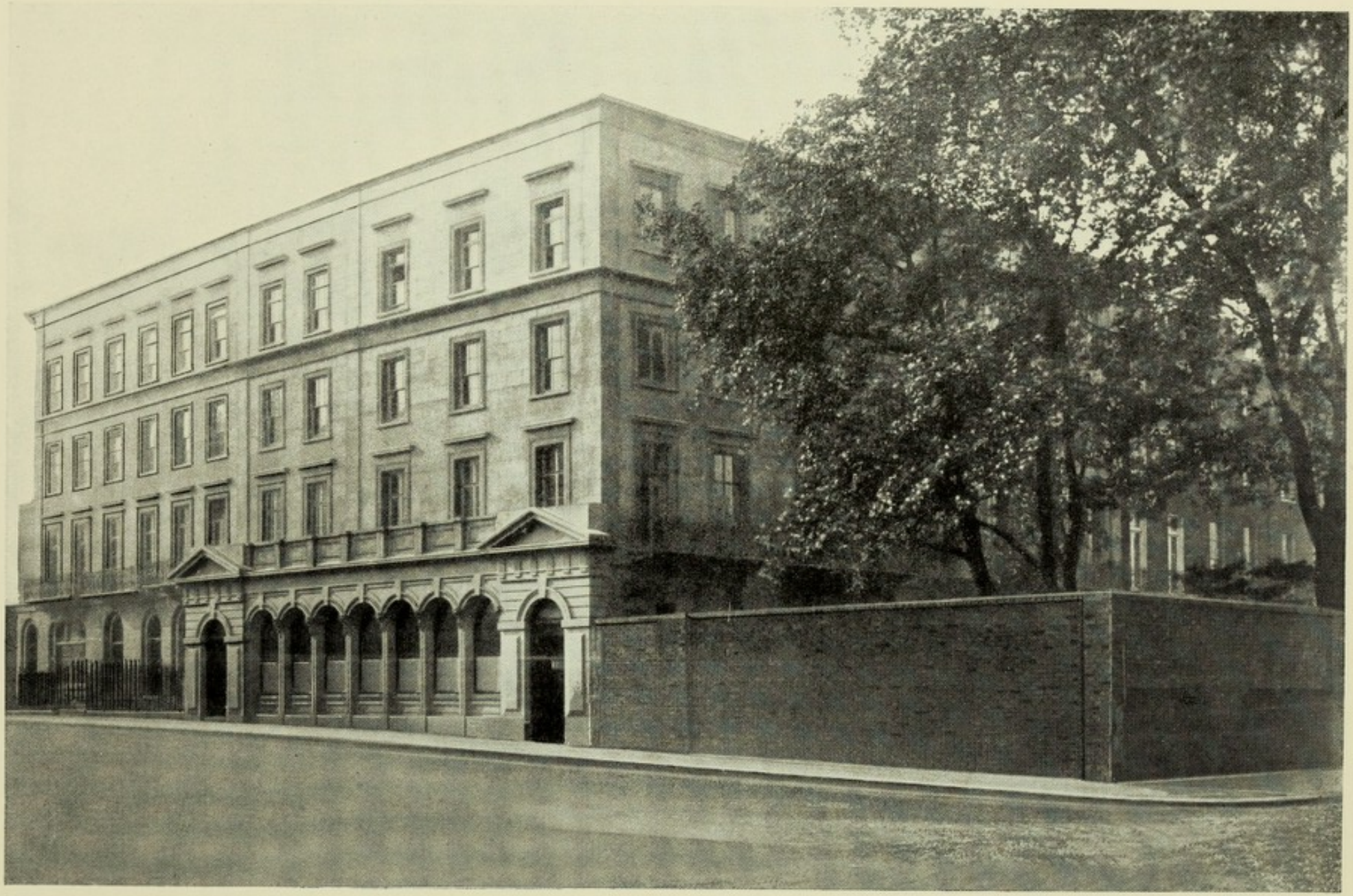
1228. Faton, J. F. E. : " De L'Emploi du Sulfate de Quinine dans le traitement du Rhumatisme articulaire Aigu." Paris, 1848.

1229. Caventou, J. B. : " Nuova Nomenclatura Chimica." Torino, 1826.

1230. Delondre, A., et Bouchardat, A. : " Quinologie des Quinquinas." Paris, 1854. (Copy autographed by both Authors.)

1231. Pelletier et Caventou, MM. : " Analyse Chimique des Quinquina." Paris, 1821. (Copy autographed by J. B. Caventou.)

1232. Guibourt, N. J. B. G. : " Histoire des Drogues Simples." Vol. 1. Pages 408–460 on " Quinquinas." Paris, 1826.



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