THE FIRST DAYS OF THE NEW SUBMARINE VOLCANO NEAR KRAKATOA

BY

Dr. J. H. F. UMBGROVE.

The geological history of the Krakatoa volcano, especially the eruption of 1883, is amply described in the great work "Krakatau" by R. D. M. VERBEEK (1885), the Report of the Krakatoa Committee (Royal Soc. London 1888) and in the publications of B. G. ESCHER (Handel. 1e Nederl. Indisch Natuurwetenschapp. Congres 1919). In the last named the history of the Krakatoa-volcano is clearly shown in a block diagram series, which Professor ESCHER kindly permitted me to reproduce here as text figure 1.

Before the famous Krakatoa-eruption of August 1883 took place, there were three islands: Lang-eiland (Long island), Verlaten-eiland (Deserted island) and Krakatau (Krakatoa).

The deeper parts of these islands, that consist of approximately the same andesitic material, are the remnants, apparently, of one large volcano, which must have exploded long ago (see text-figure 1 Block I, A, B.). On the top of one of these parts the basaltic volcano Rakata was built (fig. 1 Block II) and against it the andesitic volcanoes Danan and Perboewatan (fig. 1 Block III A). These three volcanoes formed one island, named Krakatoa. After a period of two centuries (since 1680) in May of the year 1883 the volcanoes Danan and Perboewatan came into eruption and August 28th of the same year a great explosion followed: Danan and Perboewatan were blown out and entirely destroyed; the Northwestern half of Rakata also disappeared fig. 1

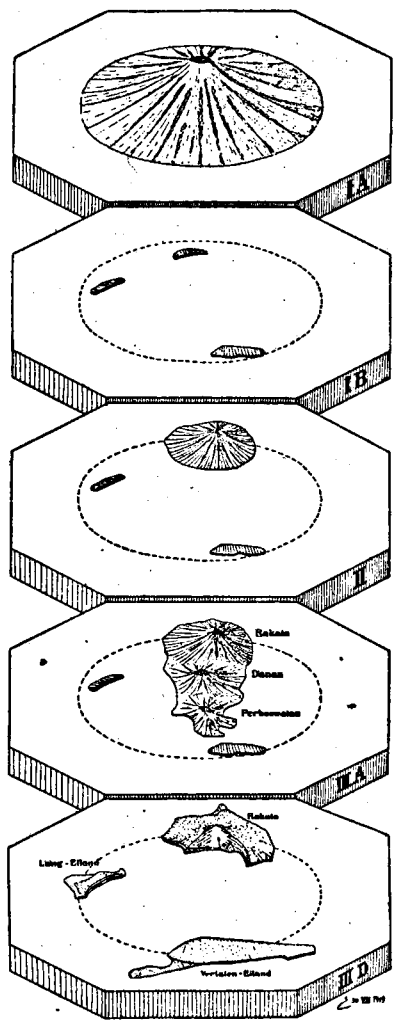

Fig. 1.

Geological History of the Krakatoa group after ESCHER.

Block III D). On their site a caldeiralike sea basin was formed of 200 to 280 M. depth (textfigure 2). The high "tidal wave" which followed the explosion intruded far into the low coastal districts of Western Java and Southern Sumatra. On this fatal day 36.417 people were drowned.

Since 1883 no trace of volcanic activity was noted in this group of islands until the last days of December 1927. News reached the resident of Bantam (Western Java), who wired to the director of the

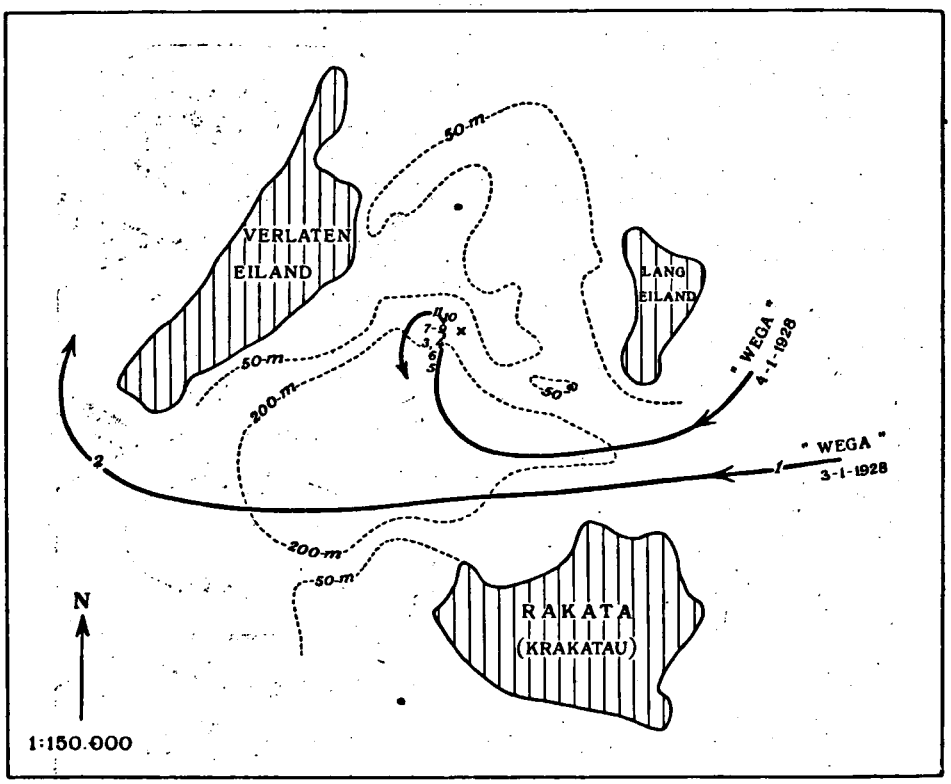

Fig. 2.

The eruption point of the new submarine volcano is indicated by the cross. The numbers 1—11 correspond to the numbers of the photographs in this publication.

Volcanological Survey that native fishermen had seen volcanic activity in the sea between the three islands. On January 3rd Dr. STEHN and Mr. ECOMA VERSTEGE with some assistants (all of the Volcanological Division of the Geological Survey in the Netherlands East Indies) left Tandjong Priok (Batavia) on board the Governement steamer "Wega". As a boat going to Krakatoa offered an unusual opportunity for studying the coral reefs of Zwarte Hoek (Rakata) the present writer was sent by the Director of the Geological Survey to join the expedition. The

following text is only a short description of some of the photographs of the eruptions, which I took on this occasion [1]).

At about five o'clock we arrived at the Krakatoa group and saw the eruptions midway between Lang-eiland and Verlaten-eiland (fig. 1). The ship passed along the North side of the steep slope of the Rakata ruin (also named Krakatoa-sensu stricto) through the above named sea basin (fig. 2). Larger ships never pass between Lang-eiland and Verlaten-eiland on account of the shallow water.

The "Wega" passed along the Western side of Verlaten-eiland and anchored between that island and the island of Sebesi (situated to the N. W.) so that we had a view of the eruptions, which generally followed eachother with a pause of ½ to 1 minute. In the evening the red glow of the ejected lava bombs could sometimes be seen; but after a short time heavy showers of rain interfered with our observations.

The next morning we studied the eruption from the coast of Lang-eiland and tried to get near the eruption point in a motor launch.

The best photographs, however, could be made in the afternoon. The Commander of the "Wega", captain J. KAREL, had also followed the activity of the new volcano with great attention, and owing to the regularity in time and size of the eruptions during the time they were observed he ventured to approach nearer than the day before.

The "Wega" passed along the East side of Lang-eiland and coming again between the three islands, approached the eruption point from the South West, the wind astern. We should like here to express our sincere thanks to captain KAREL for the kind manner in which he complied with our wishes as to the manoevres of the "Wega"; to him we owe the rare opportunity of studying the phenomenon from close quarters and being able to fix some moments of the first eruptions by photography.

Fig. 7 shows the beginning of a lava eruption; the mass bursts into a great number of glowing lava-bombs that fall back into the water (dark in the photograph) and cause the development of a steam-mass (fig. 6). We could not determine what magma was ejected because it was impossible to collect any fragments. Fig. 8 shows this steam cloud as it begins to form, fig. 9 is a later phase of the same eruption. Fig. 7—9 belong to one and the same eruption, also fig. 3 — fig. 4.

The mass of steam rises quickly and after a few moments the site of the eruption is only indicated on the surface of the sea by the suck of the former eruption, the sea still sometimes boiling in the middle and lava bombs floating in it until the gasses have escaped (fig. 4). At a distance of about 300 meters (fig. 10) the water at the surface of the sea had a temperature of 39½° C.

We often saw that an eruption began as a dome shaped elevation of the surface of the sea, which a moment later burst (fig. 5). Only seldom the contrary was observed: a sinking down of the sea-level on the spot where a moment afterwards the lava was thrown out.

[1]) Published in this periodical by permission of the Director of the Volcanological Survey in the Netherlands East Indies.

Generally after ½ to 1 minute the spectacle was renewed, accompanied by a noise like remote gunfire. Exceptionally a longer pause, of 8 up to 15 minutes, was observed; after such a rest the eruption was much larger (fig. 2, 10, 11). It was noted that several eruptions in linear arrangement of about 500 Meters length and in a direction from nearly N.W.—S.E. would follow eachother with short intermezzo's (fig. 7—9).

Ejections in an oblique direction were often seen (fig. 7). The direction in which the photographs were made and the distances may be seen from text figure 2.

The height of a lava eruption as measured by the officers of the Wega by means of a sextant was generally 50 M. above sea level (fig. 3 and 6); some heavy explosions reached a height of 120 M. (fig. 8) up to 200 Meters above the surface of the sea (fig. 2, 10 and 11).

We were all of opinion that on the 4th of January the eruptions were somewhat larger and rose higher than the day before; it seemed plausible that the longer this regular volcanic activity of the Strombolian type should last the more the volcano would grow to the surface and that the eruptions would increase steadely as the overlying, quenching, water mass diminished in thickness.

In the night of 4/5 January the "Wega" turned home (Batavia). A few days afterwards a new expedition left for Krakatoa. Concerning these later investigations I refer to an extensive publication on this eruption, which will be given in the near future by Dr. E. STEHN in: "Vulkanologische Mededeelingen", one of the publication-series of the Department of Mines in the Netherlands East Indies. Some preliminary notes from his hand may be found in: "Bulletin of the Netherlands East Indian Volcanological Survey No. 4, 5, etc. 1928".

Bandoeng, 20 January 1928.

EXPLANATION OF PLATES

Plate 42 Fig. 1. An eruption of the new submarine volcano between Lang-eiland, to the right and Verlaten-eiland, in the distance, seen from the S.E. on the evening of the 3rd of January 1928.

Plate 43 Fig. 2. Huge steam cloud at the end of a large eruption, seen from the S.W.; about sunset of the 3rd of January 1928. To the right Lang-eiland.

Plate 44 Fig. 3. An eruption in its initial stage. In the distance the Northern end of Lang-eiland.

Fig. 4. The site of the eruption, shown in fig. 3 is indicated in this photograph by the boiling sea surface.

Fig. 5. Sometimes an eruption began by a dome shaped elevation of the sea surface. A moment later the lava bombs burst through it as shown in this photograph. To the right the Northern end of Lang-eiland.

Fig. 6. This photograph clearly shows the beginning of the steam cloud, caused by the glowing lava that falls back into the sea. To the right Lang-eiland.

Plate 45 Fig. 7-9. Three phases of the same eruption series. The eruption shown in fig. 7 is indicated by the steam mass at the right of fig. 8; the lava bombs of the eruption in fig. 8 caused the steam cloud in the middle of fig. 9; the end phase of another eruption is seen on the left of fig. 9 and the ejection of a new one at the right of the same photograph; a series of five eruptions thus being shown by these three photographs.

Plate 46 Fig. 10. The end phase of an eruption as shown in this photograph can be seen in fig. 2 and fig. 11.

Plate 47 Fig. 11. End of an eruption as shown in fig. 10. To the right „tidal wave".

Photograph by Dr. J. H. F. UMBGROVE.

Fig. 1.

PLATE 42

Photograph by Dr. J. H. F. UMBGROVE.

Fig. 2.

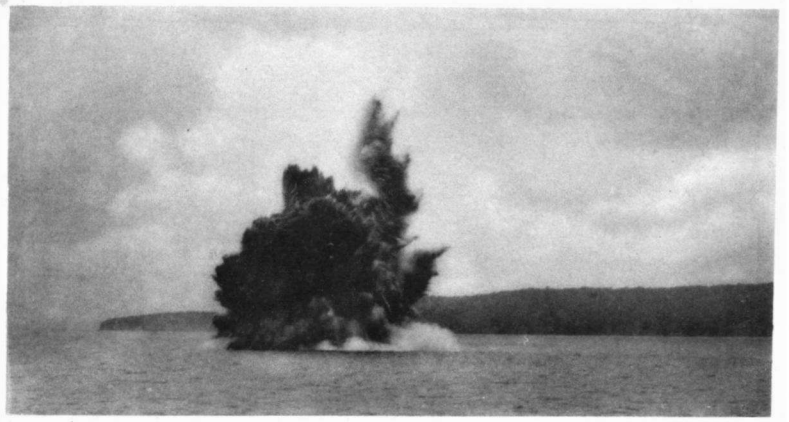

Fig. 3.

Fig. 4.

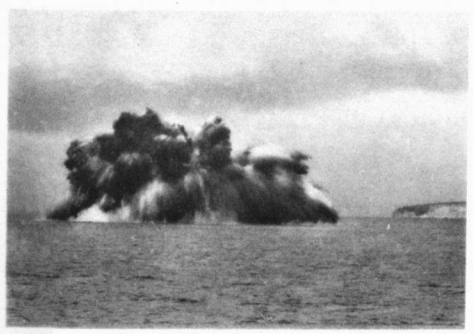

Fig. 5.

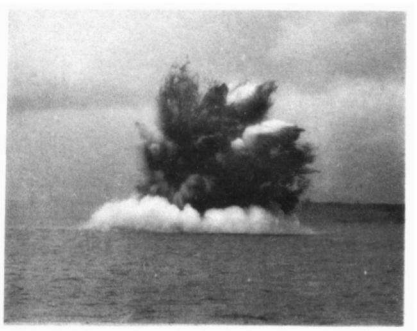

Fig. 6.

Photographs by Dr. J. H. F. UMBGROVE.

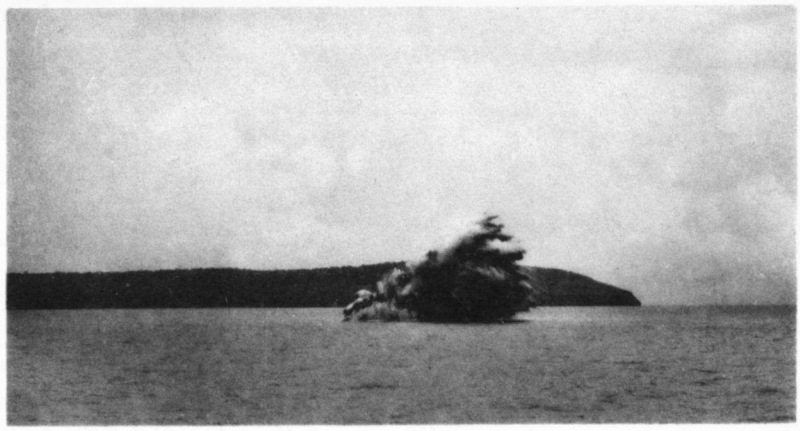

Fig. 7.

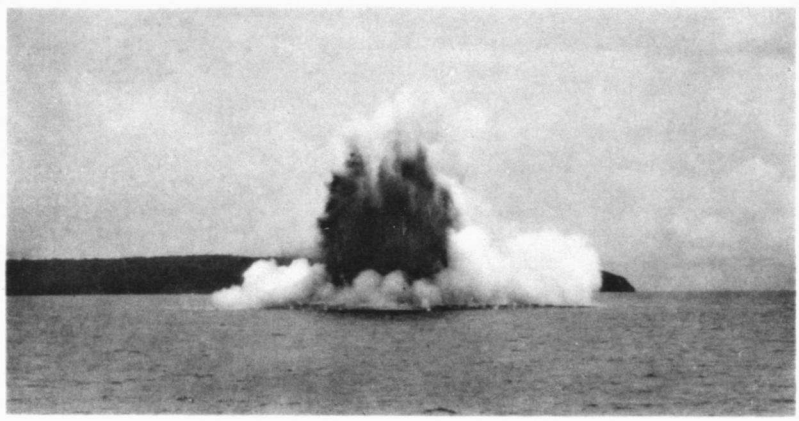

Fig. 8.

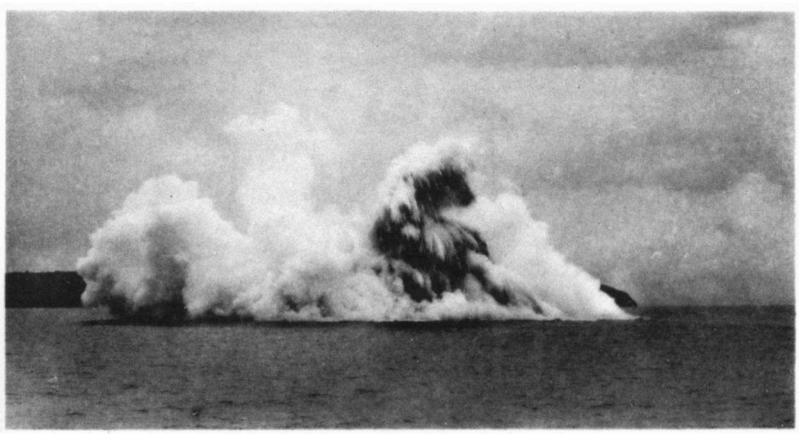

Fig. 9.

Photographs by Dr. J. H. F. UMBGROVE.

Fig. 10.

Photograph by Dr. J. H. F. UMBGROVE.

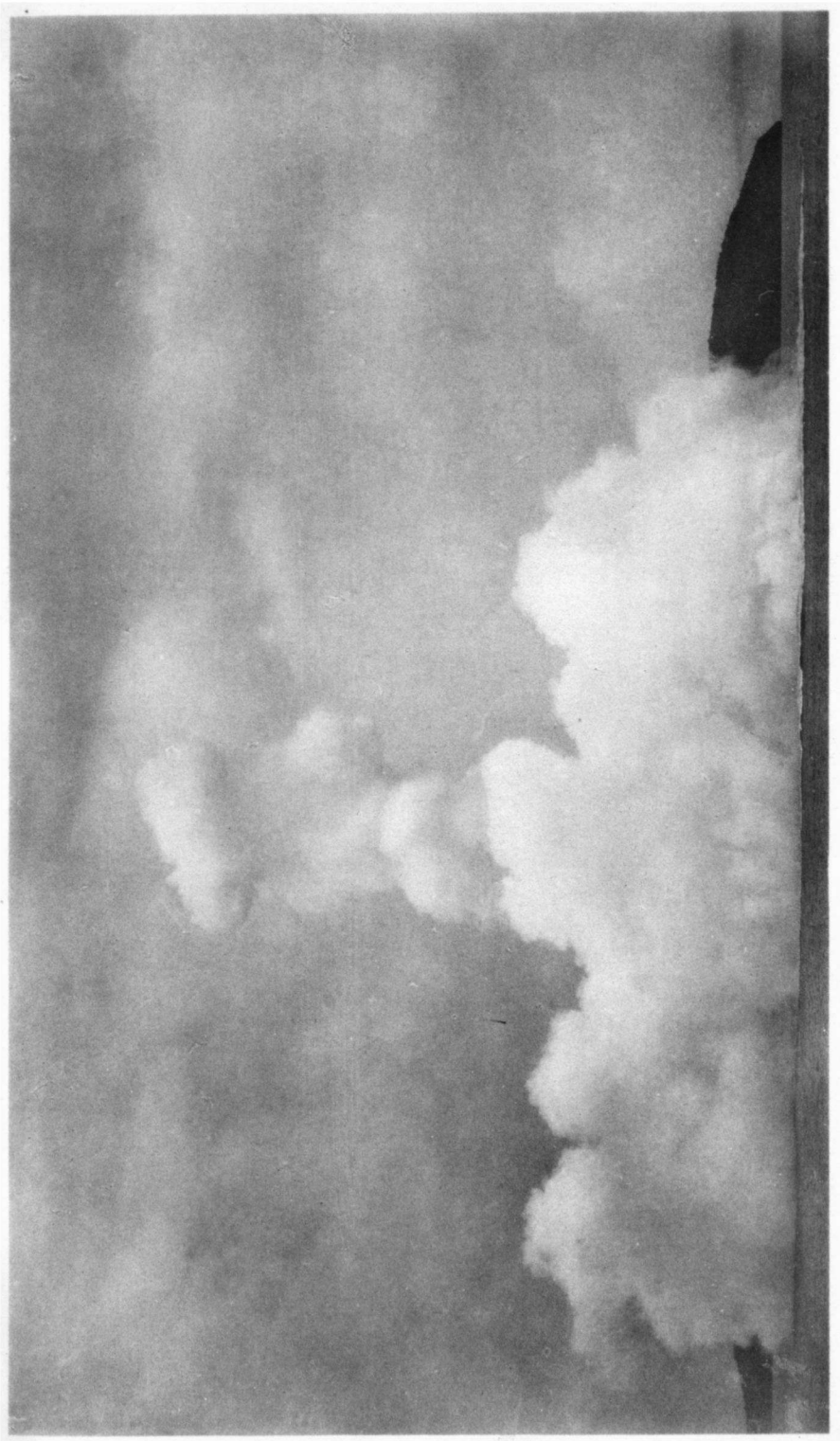

Fig. 11.

Photograph by Dr. J. H. F. Umbgrove.