1.°8 and 9.°4 C higher for the two latter days than for the first. Applying provisionally these corrections to the temperature observations at Seto on Sept. 25th, 1914, and on April 25th, 1915, we get the results enclosed in brackets, which may be compared to the different quantities for April 12th, 1914. It will be seen that the corrected sea-water temperatures along the different parts of the Seto strait lava did not much vary between Sept. 1914 and April 1915, the maximum value being about 80° C. This is about 10°C lower than the corresponding temperature of 90°C for April 1914, probably indicating the decline in the heating capacity of the lava mass in question during the 5 subsequent months.

Chapter V. New Lava Islets.

40. New lava islets. (See figs. 114 to 117.) The recent eruption was not followed by a formation of new islands of more or less considerable dimensions, as was the case with the Sakura-jima catastrophe of 1779. There appeared, however, a number of isolated massive rocks or islets, off the different new promontories of the 1*st stage* lava area. These islets, of which there is one on the Arimra or S.E. side and several are at the Ushine end of the Seto strait lava, are each rather a group of rocks composed of two parallelly arranged halves, either completely or partially separated by a well cut central cleavage crack or canal, the lavas at whose two side are curved outwards. I give next a short description of these new lava islets as examined in April 1915, their positions being indicated in fig. 2 of the preceding Number of the Bulletin.

The Arimra-jima* (fig. 108) is about 12 m high and 16 m

* Provisional denomination. *Jima* or *shima* means island or islet.

long. The central canal (AB), in the S.E.–N.W. direction, which divides the islet into two longitudinal halves, is deep and narrows towards the S.E. end, where it is 2.4 to 4.1 m in width and is filled with sea-water for the length of about 42 m. The lava forming the walls of the canal is curved down outwards, such that the islet presents a highly interesting shape, the S.W. exterior side surface (S) being composed of nearly vertical lava columns.

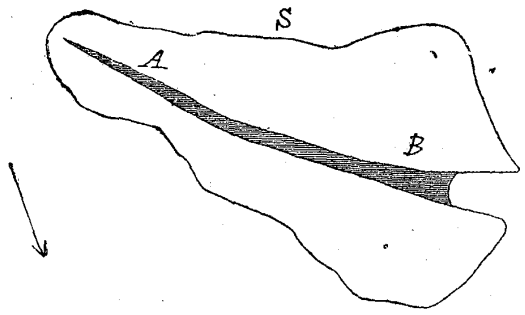

Fig. 108. Plan of Arimra-jima.
Height=12 m. Length=170 m.
AB.....Cleavage canal.
(Arrow points toward N.)

The group opposite Ushine is composed of 7 new islets, of which the Oshima is the largest and is about 20 m in height and 150 m in length. (See fig. 109.) This latter is nothing other than the southern half of the lava mass, whose longitudinal canal runs in an W.N.W.–E.S.E. direction, and, forming a sort of channel, divides the Oshima completely from the 6 small islets forming the northern half arranged in a line. The walls forming the two sides of the channel are at places nearly perpendicular and are exceedingly beautiful, being composed of upright or oblique rows of slightly twisted or wavy slender bars of lava. (See fig. 115.) Where the cleavage side is not broken up into columnar pieces, we find often the lava surface thrown into

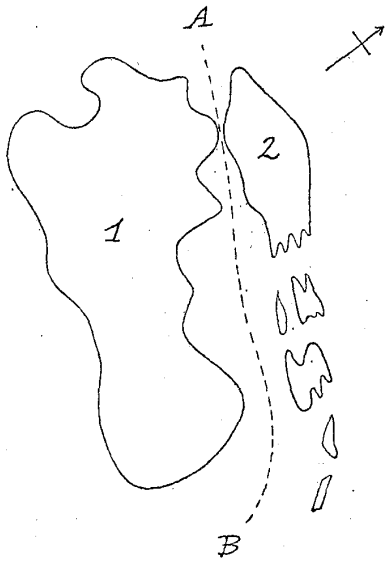

Fig. 109. Plan of new Ushine-jima lava-islet group.
Oshima (1) ... {Height=20 m. Length=150 m.
AB.....Cleavage axis (canal).
(Arrow points toward N.)

curious wavy conchoidal shapes, as if formed of a number of gigantic scallop shells. (See fig. 114.)

The Nagasaki-jima,*. which is situated to the N.W. of the Ushine-jima, is 15 m in height and 160 m in length, and has a complex shape as indicated in fig. 110. It is halved by the cleavage crack *rr* in a nearly N. and S. direction, and the western portion is further divided normally by the narrow canal *pq*. The latter is composed of two parallel portions, of which the larger is about 5 m in width and 50 m in length ; the boundary between the two being composed of a thin vertical layer *c* of upright columnar lava 2 m in height, with the appearance of a fence made up of stone or wooden posts. (See fig. 116.)

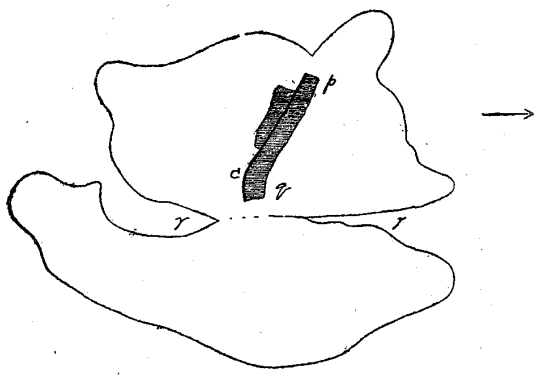

Fig. 110. Plan of Nagasaki-jima.
Height=15 m. Length=160 m.
pq.....Cleavage canal. *c*....." Fence."
(Arrow points toward N.)

41. Origin of lava islets. The different new lava islets, which already existed at the time of the present author's second visit to Sakura-jima, in April 1914, had probably been formed in the course of one or two months after the commencement of the eruption. According to fig. 81, the islet of Arimra-jima seems to have made its appearance already at the commencement of February 1914. It followed naturally that some of the islets have again been gradually buried under the advancing lava streams. Thus the picture, fig. 117, which has been taken at the end of April in 1915, represents the eastern portion of a large new lava islet 40 m in height, which had been formed off the coast of Ushine,

* Provisional denomination.

and whose other end has already been covered up by the advancing promontory. Again, the three small islets formed some distance to the east of Yunohama, which I had seen in April 1914, subsequently disappeared under the lava field, and indicated no trace of existence at the time of my next visit one year after. It is hereby to be noted that some amount of pumice and broken pieces of straws, bamboos, sticks, etc. were found on the different lava islets. On the very top of the Ushine Oshima, at the height of 20 m above the sea surface, there were found amongst the others a thick rectangular wooden plate of $12 \times 25 \times 4$ cm in dimensions, and a number of large pumice pieces 15 cm in maximum length, one of which had been caught and partly crushed among the broken lava blocks. On the other hand, the ordinary lava streams were strewn with no fragments of floating materials except at or near the height reached by the tides. These facts seem to indicate that the lava islets were raised from under the water, the rate of elevation having probably been quick enough to complete the formation of the *cleavage canal* while the lava mass still retained its molten or plastic condition.

At the times of my examination, there was no fumarole or solfatara on the lava islets. There was, however, on the top of the second largest among the Ushine islet-group an evidence of the existence at an earlier date of the issue of highly heated gases or vapours; the surface of the lava mass being, along certain fissures, covered by a wax-like glaze coating of dark green colour in the fashion of miniature stalactites.

The lava mass making up the islets in question is, unlike the material of the ordinary lava streams, of an uniform composition and somewhat loose and brittle throughout, and has a characteristic of being broken, inside as well as at the surface, into slender

wavy rods. This is probably due to the formation of the islets in consequence of the steady upward squeezing out of the magma, under a continuous high pressure, from a narrow slit or point opened either directly at the sea bottom or at the hardened upper surface of the submerged lava stream. If the orifice O (fig. 111) be small, the principal weak lines or surfaces in the molten

Diagrams illustrating the formation of the stream lines, cleavage surfaces, and folds.
Figs. 111 and 112 relate to the case of a small orifice, and fig. 113 to the case of a comparatively large orifice.

O.....Orifice in the hardened lava crust.
Arrow indicates the direction of lava flow.

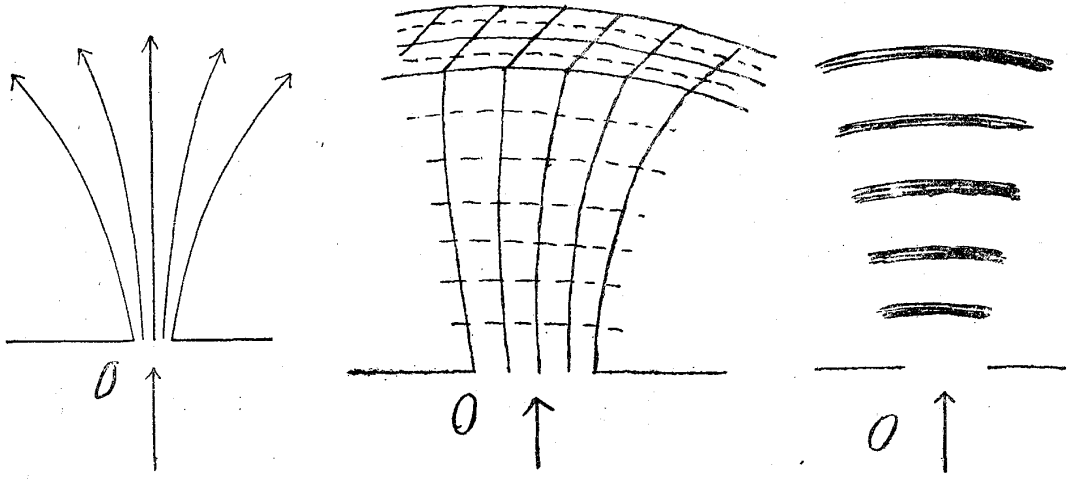

Fig. 111. Fig. 112. Fig. 113.

material pushed up will be a system of diverging curves. As the secondary weak places will be concentric surfaces formed normal to these, the lava mass will be fissured in the form of curvilinear columns as sketched in fig. 112. If the pressure with which the lava is squeezed out be very great, the whole mass would acquire some wavy arrangement in direction of the issue; giving the lava surface the scallop-like shape before mentioned.

When the orifice (fig. 113) is comparatively large, and the lava is pushed up easily, then the molten mass will acquire foldings

composed of a series of broad concentric arcs or portions of spherical surfaces, as is beautifully exhibited at portions of the ridges of the new Arimra-jima. The forms of this type were also found in a more or less clear manner at the N.W. corner of the western lava field, which projects from the S. base of Hakamagoshi into the Kagoshima channel; being the results, in this case, of the quiet oozing out of the molten lava mass, under a great horizontal pressure, from the end or side of the earlier lava streams.

Chapter VI. Volume Densities of Sakura-jima Lavas.

42. Volume density of lava.* Suppose a more or less porous piece of lava, of weight=W, to be immersed in water and to absorve moisture to the amount of W′−W. If W″ denote its weight

* The results of some of the chemical analysis of the recent Sakura-jima ejecta carried on at the Imperial Geological Survey and the Fukuoka Mining Bureau are as follows:—

Composition.	(1). Ashes collected in Kagoshima.	(2). Lava.	(3). A dark lava piece found at the vicinity of Krokami.
SiO_2	63.39	60.59	58.72
Al_2O_3	16.75	17.77	21.83
Fe_2O_3	3.10	1.23	3.02
FeO	4.00	5.59	6.37
CaO	5.38	6.34	6.68
MgO	1.43	2.39	0.20
Na_2O	3.50	3.04	1.21
K_2O	1.32	1.68	0.47
Moisture (free).	0.62	0.59	0.31
P_2O	—	0.08	
MnO	0.03	0.24	
TiO_2	0.57	0.71	
SO_3	—	0.23	
P_2O_5	0.20		
Soluble silica.	15.73		

(1) and (2) are quoted from Prof. D. Sato's report on the eruption of Sakura-jima given in the Bulletin of the Imp. Geol. Survey, 1914, and (3) from Dr. N. Ishikawa's account of the same volcanic disturbance given in the Sakura-jima Number of the Tokyo Geographical Society publications, 1915.