

did not much vary, being 2.9 and 3.1 km/sec. for the distances respectively to Tokyo and Osaka, and 3.2 km/sec. between the two latter places.

## CHAPTER XV. CONDITION OF ASAMA-YAMA, 1912 TO 1914.

**131. *Strong Asama-yama earthquakes in relation to eruptions.*** The recent extraordinary activity of the Asama-yama may be considered to have begun with the strong non-eruptive earthquake of May 26th, 1908. Yet the energetic explosions of the volcano took place first from Dec. 7th of the next year (1909), followed by several others in 1910 and 1911. After the strong explosion of Oct. 22nd, 1911, the eruptive activity was greatly reduced, there having been no important outburst of the Asama-yama during the summer of 1912. At the same time, however, the seismic activity of the volcano became very pronounced, and, amongst the others, the earthquake on July 16th (1912), at 7.45.35 a.m., was markedly strong, being, according to the tromometer observations in Tokyo, of the same magnitude with, and identical almost vibration for vibration to, the shock on May 26th, 1908. The period of the greatest explosive activity of the Asama-yama began with the outburst of May 16th, the next year (1913). From these circumstances, it seems that the opening of a period of great eruptive activity of the volcano is announced by strong seismic disturbances 10 months or  $1\frac{1}{2}$  years beforehand. Such an assumption is by no means unreasonable: for instance, the premonitory earthquake shocks of the Kirishima-yama explosion of Nov. 8th, 1913, had begun already 6 months before the latter date. In other words, the explosions, which are themselves mere surface phenomena, must be the results of the

long-continued and deep-seated underground stress accumulation, which may not be limited simply to the immediate vicinity of a particular volcano or to the extension of a single volcanic chain.

**132. Condition of crater in summer of 1912.** As mentioned in the *Bulletin*, Vol. VI, No. 1, the lava bottom of the Asama-yama crater was subject to elevation since many years, with the mean annual rate of about 4.3 m between 1887 and 1911; the actual depth measured at the NW part of the brim in June of the latter year being 120 m. This depth remained essentially unaltered on the whole till the summer of 1912, although there were evidently certain fluctuations of level and changes in form of the crater bottom attending the different strong eruptions which had happened before that year. In fact, the appearance of the bottom was constantly changing, being sometimes almost perfectly smooth, and at other times very rugged and broken into a number of high ridges. As will be seen from Fig. 1, the bottom of the crater was on July 2nd, 1912, folded into a series of beautiful regular concentric rings, with a deep depression or shaft some 20 m or so in diameter situated nearly at the centre, from which the smokes were powerfully ejected. According to the photographs and sketches taken by Professors S. Nakamura and N. Yamazaki in Sept. 1909, such had also been the condition of the crater bottom after the strong explosion of May 31st, 1909. The formation of the rings above referred to was due, not to anything like a wave motion of the fluid lava, but to the successive concentric depression or downward dislocations of the lava crust at the bottom, which had been after a previous strong eruption thrown into a plane or slightly convex surface.\* When viewed on Aug.

---

\*In this way a terrace of lava is formed along the inner circumference of the crater, as was exhibited in a most remarkable manner during the recent activity of the O-shima volcano.

23rd (1912), the lava rings in the northern half of the crater bottom were broken away and substituted by a number of small vents formed on an irregular field of apparently sandy scoriae. (See Figs. 72 and 74.)

**133. Eruptions of Oct. 2nd and Dec. 13th-14th, 1912.** On Oct. 1st, 1912, the condition of the crater bottom has been ascertained by Mr. T. Kato to be nearly in the same condition as on Aug. 23rd in the previous summer. The very next day, on Oct. 2nd, took place the special outbursts which consisted in the occurrence of several hundred small non-detonative eruptions, extending over a time interval of more than 9 hours. (See § 71.) As the result of this long-continued activity, the lava layer at the crater bottom was converted into one smooth convex field and raised through an extraordinary distance of about 30 m. (See Fig. 73.) The upheaval of the lava mass was much increased by the stronger outbursts on Dec. 13th and 14th of the same year, which lasted about 31 hours. One week after, namely, on Dec. 21st, the author, who ascended the mountain with Mr. Kanbayashi, of the Nagano meteorological observatory, found the bottom elevated practically to the brim, the steep cliff inside walls of the crater having been entirely buried by the lava, which was, should any further outburst of similar nature take place, ready to flow out northwards, the crater wall being lowest in that direction. The possible descent of lava streams was, however, no cause of much uneasiness, as these would have no high velocity of progress, and be, further, brought to stoppage already at the mountain base, being thus unable to reach, and cause damage in, the villages themselves. (See Fig. 15). The event of more dreadful nature was in the downrush of a burning "mud stream" or "volcanic avalanch." As described in the *Bulletin*, Vol. VI, the enormous

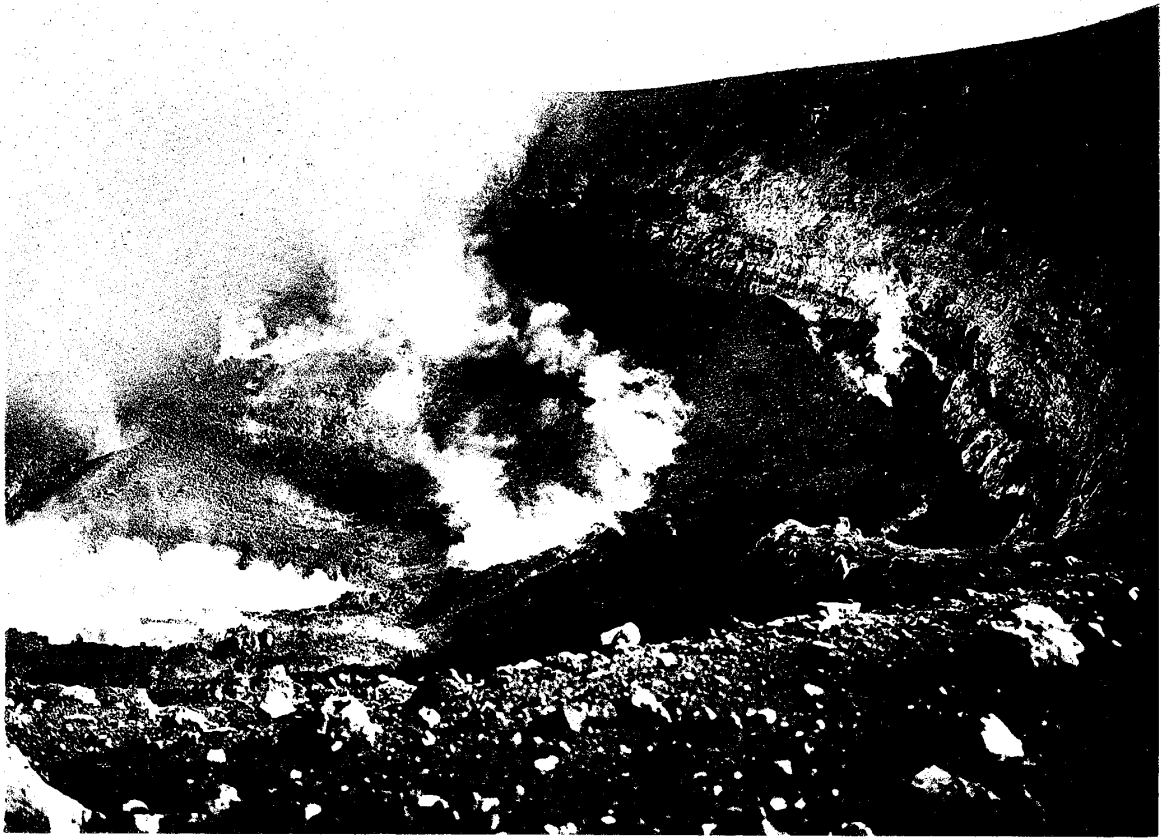


Fig. 72. Crater of Asama-yama, seen from SSW, on Aug. 23rd, 1912. (F. Omori, phot.)

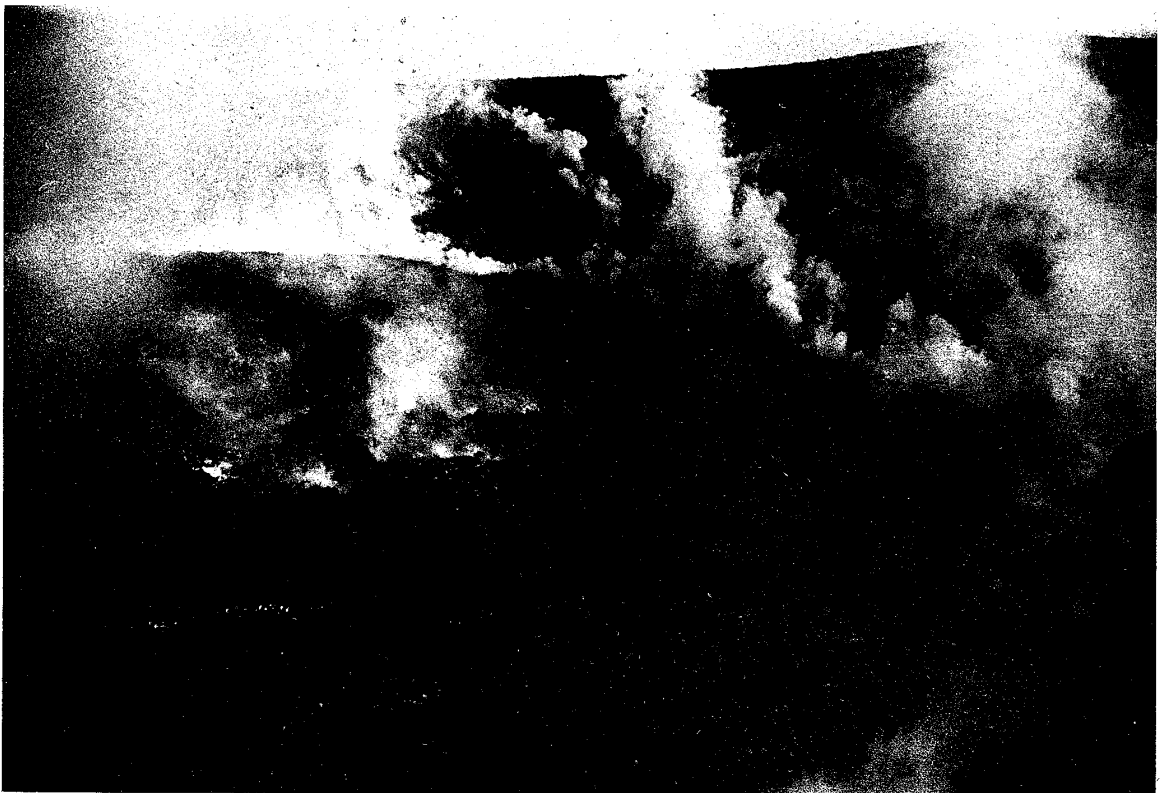


Fig. 73. Crater of Asama-yama, seen from SSW, on Oct. 14th, 1912, showing a remarkable elevation of the bottom, consequent to the eruption on the 2nd of the same month. (T. Kato, phot.)



Fig. 74. Crater of Asama-yama, seen from SSW, on Aug. 23rd, 1912. (F. Omori, phot.)



Fig. 75. Central cone of Asama-yama, seen from W. at the entrance of Muken-dani. Dec. 21st, 1912.

damage on the occasion of the great Temmei (1783) catastrophe of the Asama-yama was due to the tremendous "volcanic avalanches," which precipitated themselves northwards into the upper valley of the river Agatsuma-gawa, a tributary of the Tone-gawa. Similar events occurred evidently also in the older times; the whole southern slope of the Asama-yama between Kutsukake and Miyota being covered by the product of the former volcanic avalanches, which took place probably on the occasion of the eruptions in Aug. to Oct., 1108, when the volcanic stones, sands, and ashes are said to have buried the cultivated fields for about 18 miles.\*

The occurrence of new volcanic avalanches, at least, of those of any large magnitude, seemed, however, improbable. Thus, before the great Temmei eruptions the Asama-yama had been very quiet for about 50 years and the crater had been entirely filled up, the rocks and earth at the mountain top, by exploding which the deep central vent was opened up, having probably furnished the material of the fearful volcanic avalanches; whereas the present conditions of the Asama-yama, which has maintained activity since 1908 are different from those for 1783, there having existed the actual crater from the commencement, with no obstacle to the free overflowing of the inside lava mass. The above was the reasoning, by which I tried to remove the panic of the people of the villages and towns at the mountain bases, and, as a matter of fact, the conditions of the crater have changed since then considerably for the better, as mentioned in § 135.

The half pumiceous light-brownish lava masses, projected out

---

\* Along the railway and also from among the village grounds of Kariyado and Furujiiku, situated between the towns of Oiwake and Miyota, recently were discovered at many places "natural charcoal," or trees, apparently *Quercus glandulifera*, converted actually into charcoal in consequence of having been covered up by the hot materials of the volcanic avalanches in the above mentioned remote epoch. The charred trees were so far generally found at the depth of 1 or 2 metres.

on the occasion of the eruptions of Dec. 13th-14th (1912) was considerable in amount and covered the whole mountain top\* ; having entirely buried the large radial cracks at the west side. Among the numerous bread-crust bombs, found on this occasion at the Muken-dani and around the crater, there were several of light bluish-white colour, which contained pieces of cordierite (Fig. 11).

**134. Strong explosions in 1913.** The year 1913 may be regarded as forming the most explosive period of the Asama-yama since its great outbursts in 1783 ; the strong explosions, which were frequent just in the months of May, June, July, and August, greatly terrifying the people at Karuizawa, a favourite summer resort for the fashionable Japanese and the foreign residents. The author was at the time asked many questions regarding the supposed inclination of the crater shaft toward Karuizawa, the best things to be done in the case of poisonous gases spreading over the latter place, etc. Finally, on July 25th the foreign visitors in Karuizawa sent to me, through Mr. R. A. Coates, a telegram stating their resolution to leave the place, if there be any danger from the Asama-yama eruptions. The following is the note, which I wrote in answer under the date of July 26th, assuring them that there was no cause for panic:—"The Asama-yama explosions, occurring at present once every 5 or 6 days, throw out hot lava fragments, which reached the observatory ground already on three occasions. Consequently, the seismological observations have, in a near future, possibly after a few weeks, to be made at a lower station. The furthest distance of the stone *projection* is, however, only about  $1\frac{1}{2}$  miles, so that even in a very

---

\* Fig. 75 is a picture of the Asama-yama top taken from the Muken-dani at about 10 a.m., on Dec. 21st. The mountain slope was thinly covered with snow (maximum depth=0.5 m) and the air temperature at the crater rim was only  $-1^{\circ}\text{C}$ , due no doubt to the warming effect of the hot lava masses in the crater.

violent explosion the lava fragments would never be thrown to Karuizawa and other villages at the mountain base. Thus, there is....no danger to life at Karuizawa in connection with the Asama-yama explosions. Neither there is any necessity for quitting the place, so long as these occur singly, however violent. Should the eruptions continue (i.e., occur one after the other at very close intervals, say, once every a few minutes,) for several consecutive days, hot ashes, sands, and pumice might commence to fall at Karuizawa and then it would be prudent for the people to leave the place gradually." The volcanic gases proved very injurious to plants, and by degrees the extensive forests of *Pinus densiflora*, especially those in the different radial valleys, were caused to die. On the Roku-riga-hara, at the N. base of the Asama-yama, even the comparatively well-resisting *Larix leptolepis* began to be killed since 1912.

According to the report of Mr. J. Nishizawa, Director of the Nagano meteorological observatory, who ascended the mountain on April 11th, 1913, the crater bottom, elevated at the end of 1912, seems to have suffered some change and been depressed such that the top of a small lava mound, which came into existence at the centre, was some 10 m. below the lowest, or N side, point of the surrounding wall. During the following summer months, the ascent was too risky on account of the frequent violent explosions, which projected hard lava blocks and bombs to the unusually great radial distances; the effects, not merely of the shallowness of the crater, but principally of the approach of the centre of volcanic activity to a certain depth most favourable for the projection of lava fragments. (§ 6.) Apart from the explosions, however, the earthquake effects accompanying the non-detonative eruptions of Nov. 6th (1913) at 1.21 and at 7.35 p.m., gave unusually large records in Tokyo, the motion in the latter case having lasted



about 23 min. Thus, it being desirable to ascertain the condition of the crater, I ascended the mountain on Nov. 19th, in company with my assistant, Mr. H. Kurosaka, and found, rather contrary to my expectation, the crater bottom markedly depressed, to a depth of some 30 fathoms below the brim (at the SW part); the central well-like hole, from which the smokes were powerfully emitted, being surrounded by a long hilly arc, which was probably the remnant of the "lava rings" similar to those before mentioned. The upper part of the mountain was covered by the massive lava pieces of dark colours, which completely hid the lighter materials ejected out by the eruptions at the end of the preceding year; the new maximum block, found at the Muken-dani, being about 3 m in length. In spite of the extraordinary explosive activity, then, the crater bottom was, in 1913, on the way of being again depressed back. Further, a marked feature of the Asama-yama activity in the same year was the extremely small number of the non-eruptive earthquakes originating from the volcano.

**135. Condition of Asama-yama in 1914.** According to the accounts of Dr. I. Ishiguro and Professor A. Tanakadate, Mr. J. Nishizawa, and Mr. H. Kurosaka, who ascended the volcano this year respectively on May 27th, June 21st, and July 26th, the depression of the crater bottom is steadily continuing; the depth at the east side being, in the estimation of Mr. Nishizawa, being nearly 80 m. Coupled to this fact, both the seismic and the eruptive activities of the Asama-yama have suffered a considerable reduction in the course of the present year so far. Thus, in the tromometer registers at Yuno-taira, there were, between May 1st and July 17th, (1914), altogether 13 non-eruptive volcanic shocks and 19 eruptions, of the latter only that on May 5th being strongly explosive. The smallness of the activity of the

Asama-yama in the time interval under consideration will be realized, when we remember of the large number of the violent explosions in 1913, or of the Yuno-taira tromometer registrations, which amounted to 378 non-eruptive volcanic shocks and 577 eruptions in 1911, between June and October, and to 687 non-eruptive shocks and 1,111 eruptions in 1912, between May and October. Turning our attention at large to the recent volcanic manifestations in the different parts of Japan, we notice that, the Yake-dake, the O-shima, the Kirishima-yama, and the Sakurajima, which made marked eruptions after (in the case of the Yake-dake, before) the commencement in 1908 of the activity of the Asama-yama, have all now already been brought to end, and, from various circumstances, the Asama-yama itself is to be supposed also to be on the way of settling back to its ordinary condition.

July 1914. Tokyo.