CHAPTER II. YEARLY AND MONTHLY NUMBERS OF THE ASAMA-YAMA DISTURBANCES.

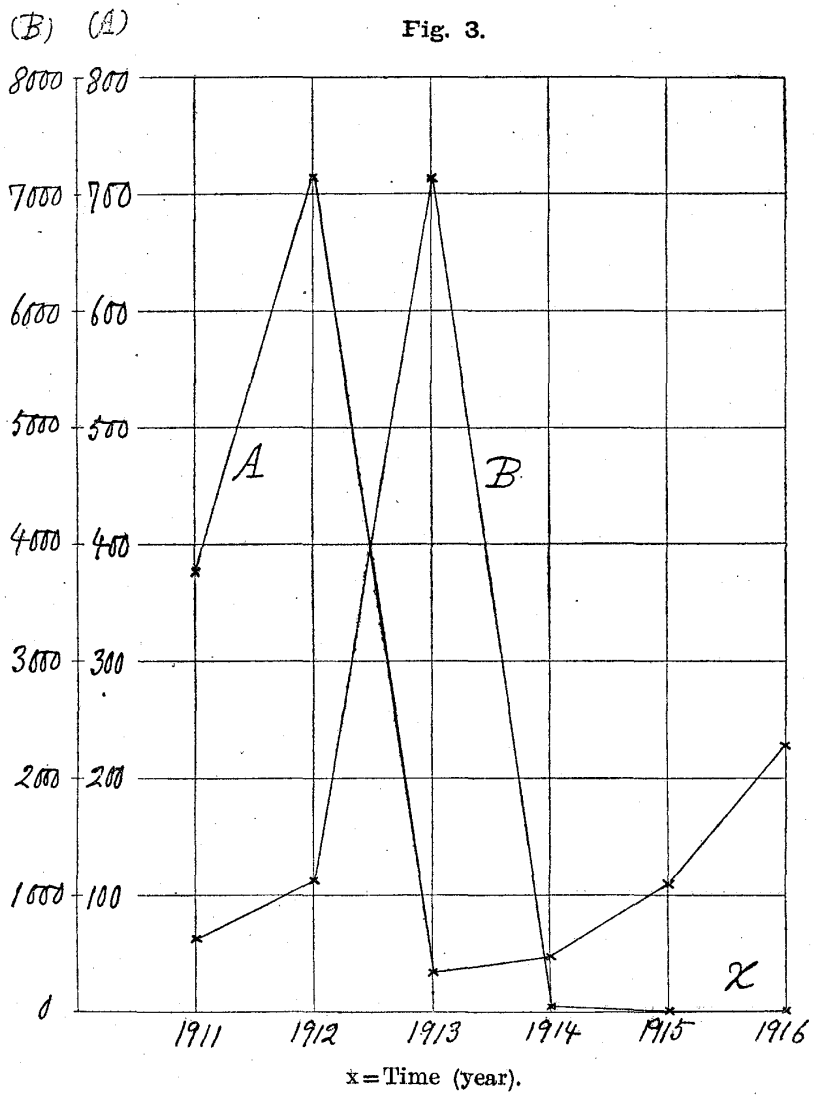
5. *Yearly and monthly numbers of Asama-yama eruptions and earthquakes.* In Table II are given the monthly frequencies for May to October during the 6 years between 1911 and 1916 of the A type disturbance or the volcanic earthquake not directly accompanied by an outburst, and of the B type disturbance or the shaking of the ground caused by an eruption of the Asama-yama. From figs. 3 and 4 it will be seen that, both in the yearly and in the monthly variation, the earthquakes (A) reached the maximum frequency prior to the eruptions (B). Again, the eruptions (B) were some 6 times more numerous than the earthquakes (A), the frequency variations of the two classes of disturbance being on the whole mutually opposite. In this connection it is interesting to note that the violent Asama-yama earthquake of May 26th, 1908, was followed after one year by the strong explosions of May 31st and Dec. 7th, in 1909; the similarly violent Asama-yama earthquake of July 16th, 1912, having also been followed by the several strong explosions in 1913. Thus the earthquakes (A) are essentially of the nature of precursors to the eruptions (B).

TABLE II. YEARLY AND MONTHLY FREQUENCIES OF THE ASAMA-YAMA DISTURBANCES, 1911—1916.

Month. / Year.	May.	June.	July.	August.	September.	October.	Sum.
	(A) Volcanic Earthquake not accompanied by Eruption.						
1911	—	—	131	38	144	63	**376**
1912	54	288	327	15	20	10	**714**
1913	13	10	0	5	4	2	**34**
1914	5	7	7	11	8	10	**48**
1915	12	16	21	14	29	17	**109**
1916	14	5	21	25	55	108	**228**
Sum.	**98**	**326**	**507**	**108**	**260**	**210**	**1509**
	(B) Eruption.						
1911	—	—	149	205	110	150	**614**
1912	12	15	195	106	163	626	**1117**
1913	20	450	1428	3763	765	700	**7126**
1914	7	12	1	0	2	9	**31**
1915	0	0	0	0	0	0	**0**
1916	0	0	0	0	0	2	**2**
Sum.	**39**	**477**	**1773**	**4074**	**1040**	**1487**	**8890**

Variation of Yearly and Monthly Frequencies of the Asama-yama Disturbances.

Fig. 3.

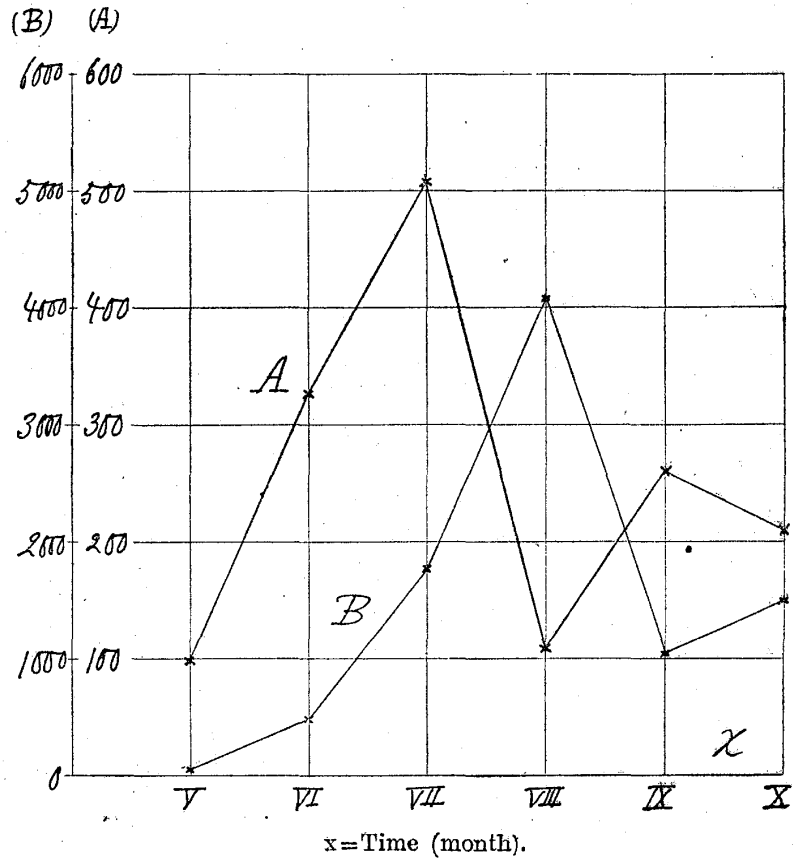


x=Time (year).

(A)....Asama-yama Volcanic Eqke. not accompanied by Eruption.

(B)....Asama-yama Eruption.

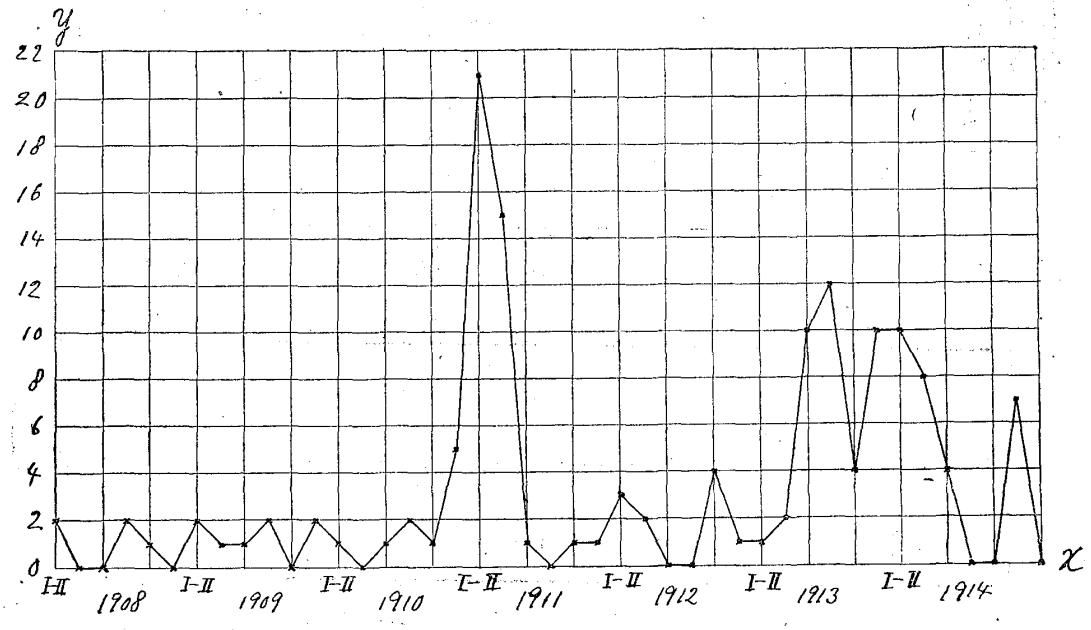
Fig. 4.



x=Time (month).

6. *Monthly frequency of stronger explosions.* Table III gives the monthly numbers of the stronger Asama-yama outbursts, during the 10 years between 1908 and 1917, the maximum frequencies of 17, 10, and 10 having been reached respectively in Jan. and April 1911, and in Nov. 1913. From the graphical representation in Fig. 5. it will be seen that the recent explosive

Fig. 5. Variation in the 2-Monthly Frequency (=y) of the Stronger Asama-yama Explosions.



x=Time (in 2-months interval).

activity of the Asama-yama was greatest at the following two epochs: (i), Dec. 1910 to April 1911; (ii), April 1913 to May 1914. The activity of the volcanoes of Yake-dake and O-shima followed the (i) epoch, while that of the Kirishima-yama and the Sakura-jima, in Kyushu, took place in the latter part of the (ii) epoch. The outbursts of the Tarumai-san and the Usu-san, in Hokkaido, preceded the (i) epoch Asama-yama eruptions.

TABLE III. YEARLY AND MONTHLY NUMBERS OF THE STRONGER ASAMA-YAMA ERUPTIONS, 1908—1917.

Year. / Month.	1908	1909	1910	1911	1912	1913	1914	1915	1916	1917	Sum.
I	—	1	—	17	1	—	7	—	—	—	26
II	2	1	1	4	2	1	3	—	—	—	14
III	—	—	—	5	—	—	6	—	—	—	11
IV	—	1	—	10	2	2	2	—	—	—	17
V	—	1	1	1	—	3	3	—	—	—	9
VI	—	—	—	—	—	7	1	—	—	—	8
VII	—	1	2	—	—	7	—	—	—	—	10
VIII	2	1	—	—	—	5	—	—	—	—	8
IX	1	—	—	—	—	1	—	—	—	—	2
X	—	—	1	1	4	3	—	—	—	—	9
XI	—	1	1	—	—	10	4	—	—	—	16
XII	—	1	4	1	1	—	3	—	—	—	10
Sum.	5	8	10	39	10	39	29	—	—	—	140

7. *Relative frequencies of sensible and unfelt earthquakes*

The numbers of the sensible and the unfelt A-type earthquakes were, as shown below, in the mean ratio of 1 : 4.6 during the four years 1911 to 1914, when the volcano was making frequent explosions. In 1915 and 1916, when the Asama-yama ceased to make outbursts, the ratio in question became 1 : 2.1. Thus after the end, (and probably also previous to the commencement), of an epoch of the eruptive activity, the stronger and sensitive non-eruptive earthquakes became proportionally more numerous.

Year.	(i) Number of Sensible Shocks.	(ii) Number of Unfelt Shakings.	Sum.	Ratio: $\frac{ii}{i}$	Mean Ratio.
1911	57	321	378	5.6	4.6
1912	124	563	687	4.5	
1913	6	28	34	4.7	
1914	11	37	48	3.4	
1915	44	65	109	1.5	2.1
1916	64	165	229	2 6	

CHAPTER III. DURATION OF THE VOLCANIC DISTURBANCES.

8. *Duration of preliminary tremor of A-type earthquake.* According to the Yuno-taira observations during the 6 years, 1911 to 1916, the number of cases of the duration (y) of the preliminary tremor of the A type, or non-eruptive, volcanic earthquakes above and below 0.5 sec. were as follows :—

Interval.	Year.	Number of cases, $0.0<y<0.5$ sec.		Number of cases, $0.5<y<1.0$ sec.		Ratio: N_1/N_2
I	1911	111	Sum. $447=N_1$	46	Sum. $173=N_2$	2.6
	1912	321		123		
	1913	15		4		
II	1914	30	$145=N_1$	15	$84=N_2$	1.7
	1915	54		25		
	1916	61		44		