

[December 13, 1883.]

## THE PRESIDENT in the Chair.

The Right Hon. Lord Justice Sir Edward Fry, whose certificate had been suspended as required by the Statutes, was balloted for and elected a Fellow of the Society.

The Presents received were laid on the table, and thanks ordered for them.

The following Papers were read:—

- I. "Note on a Series of Barometrical Disturbances which passed over Europe between the 27th and the 31st of August, 1883." By ROBERT H. SCOTT, F.R.S., Secretary to the Meteorological Council. Communicated by desire of the Council. Received December 4, 1883.

## Plate 1.

The occurrence of sudden temporary derangements of atmospheric pressure has been occasionally noticed at all observatories provided with barographs, either mechanical or photographic.

Among the most remarkable of these which have been recorded in these islands have been that of January 16, 1869, which appeared at Aberdeen, and to a less extent at Glasgow, and that of January 30, 1876, which was noticed chiefly at Armagh and Aberdeen, and was described by me in a note published by the Meteorological Society ("Quarterly Journal," vol. iv, p. 73).

In both of these cases the depression of the barometrical column amounted to about 0·1 inch, and the duration of the entire disturbance to about ten minutes. In both cases the anemometers showed sudden disturbances both in the direction and force of the wind, and on the latter occasion certainly a shower fell. In 1869 no self-recording rain-gauges existed.

It is evident that both of these disturbances were due to the passage of squalls.

The phenomena which I have now to notice are very remarkable, inasmuch as they are not accompanied by any traceable disturbance of any other element than pressure, and they appear as clearly at Coimbra and St. Petersburg as at our own observatories.

The broad facts to be recorded are that at the end of August a violent volcanic eruption took place in the Straits of Sunda (in 105°

east longitude). The continuance of the shocks is given at from 4 P.M. on the 26th to daybreak on the 27th, corresponding to the interval from 9 A.M. to 10 P.M. on the 26th, Greenwich time; but they probably continued for a longer period. No precise statement as to the moment of occurrence of any particular explosion or shock has as yet been printed.

Two letters have been received at the Meteorological Office from the Board of Trade, one from Her Majesty's Consul at Batavia, and the other an extract from the log of the Dutch steam ship "Governor-General Loudon," which ship was in Sunda Straits at the time of the eruption, having called at Anjer the day before it took place, and again after the place had been swept by the earthquake sea-wave. Neither of these accounts contains any precise statement as to time of any particular phenomenon.

The facts which I have to bring to the notice of the Society are the indications of successive disturbances of the barometer occurring also at the end of August, at regular intervals and at every observatory in Europe.

I shall distinguish the four disturbances shown on the engraving by Roman numerals. Greenwich time is used.

I. At about 11 h. A.M. on the 27th, a sudden increase of pressure, followed by a decrease, appeared at St. Petersburg, and a similar phenomenon was noticed at Valencia Island, and at Coimbra in Portugal, as well as at all the intermediate observatories over Europe from which we have been able to obtain tracings of barograms.

The character of the disturbance was not strictly identical, for at the western stations the rise of the barometer was more marked than at the eastern. The general appearance of the barograms at adjacent stations is strikingly similar. It is, however, difficult to select any peculiarly remarkable phase of the disturbance so as to recognise it and record the time of its occurrence at each observatory.

This movement (I) was propagated from east to west at a very high velocity, for the recovery of pressure from the first decrease occurred at St. Petersburg at noon, and at Valencia at 2 h. 25 m. P.M. on the same day, thus taking only two hours and twenty-five minutes to traverse the distance of 1,315 miles between the two observatories.

II. A somewhat similar disturbance appeared on the 28th, but was propagated from west to east, reaching Valencia at 3 h. 20 m. A.M., and St. Petersburg at 5 h. 15 m. A.M., and thus requiring only one hour and fifty-five minutes for its passage. The same uncertainty as to identification of the phase exists in this case as in the preceding. In all cases, however, the most marked phase of the phenomenon has been noted.

III. A disturbance travelling in the same general direction as No. 1,

but from E.S.E. to W.N.W., reaching St. Petersburg at 0 h. 20 m. A.M. on the 29th, and Valencia at 2 h. 28 m. A.M. on the same day, and traversing the distance in two hours and eight minutes.

IV. A disturbance travelling in the same general direction as No. II, but from W.N.W. to E.S.E., reaching Valencia at 2 h. 0 m. P.M. on the 29th, and St. Petersburg at 3 h. 35 m. P.M., and occupying only one hour and twenty-five minutes in passage.

Similar disturbances, though of a gradually diminishing intensity, can be traced in most of the barograms, occurring at Valencia at about 3 h. P.M. on the 30th and 2 h. A.M. on the 31st. After this time the traces of disturbance become less distinctly recognisable. Some of the oscillations are more marked at some stations than at others; the Scotch observatories, in particular, exhibit the later disturbances very distinctly.

The engraving, which has been prepared in the Meteorological Office, and which shows all the records reduced to the same scale and to Greenwich time, exhibits the barograms at the following stations, which are enumerated in order of longitude, going from east to west:—

St. Petersburg.  
Pawlowsk.\*  
Vienna.\*  
Brussels.  
Paris.  
Geldeston (near Beccles, Norfolk).  
Greenwich.  
Kew.  
Oxford.  
Aberdeen.  
Stonyhurst.  
Liverpool.  
Glasgow.  
Falmouth.  
Armagh.  
Coimbra.  
Lisbon.\*  
Sierra da Estrella.\*  
Valencia.  
Toronto.

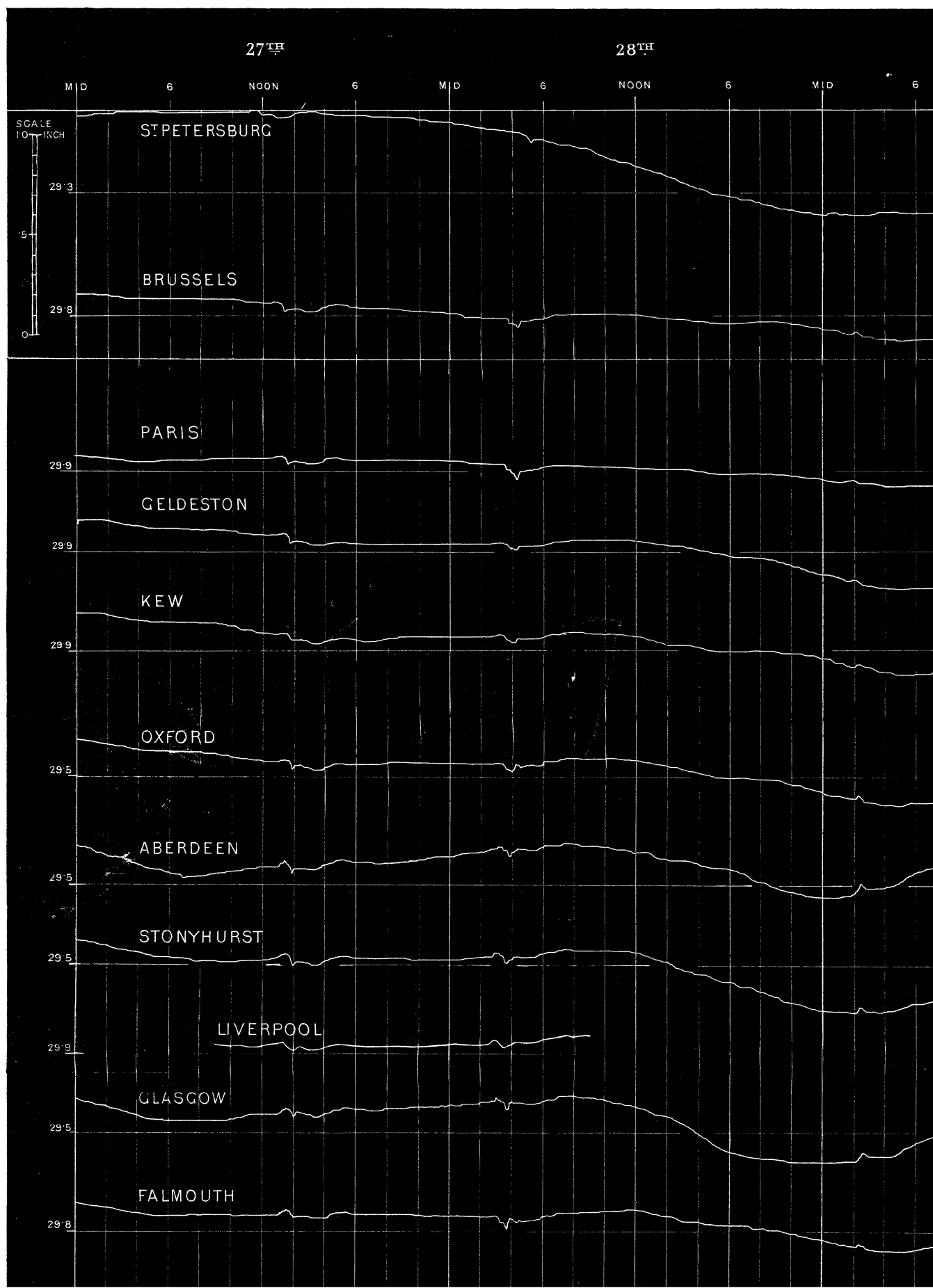
The stations marked with \* have not been engraved yet. A table is appended showing the precise times of occurrence of the different phases of the phenomena at each station as accurately as we can determine them.

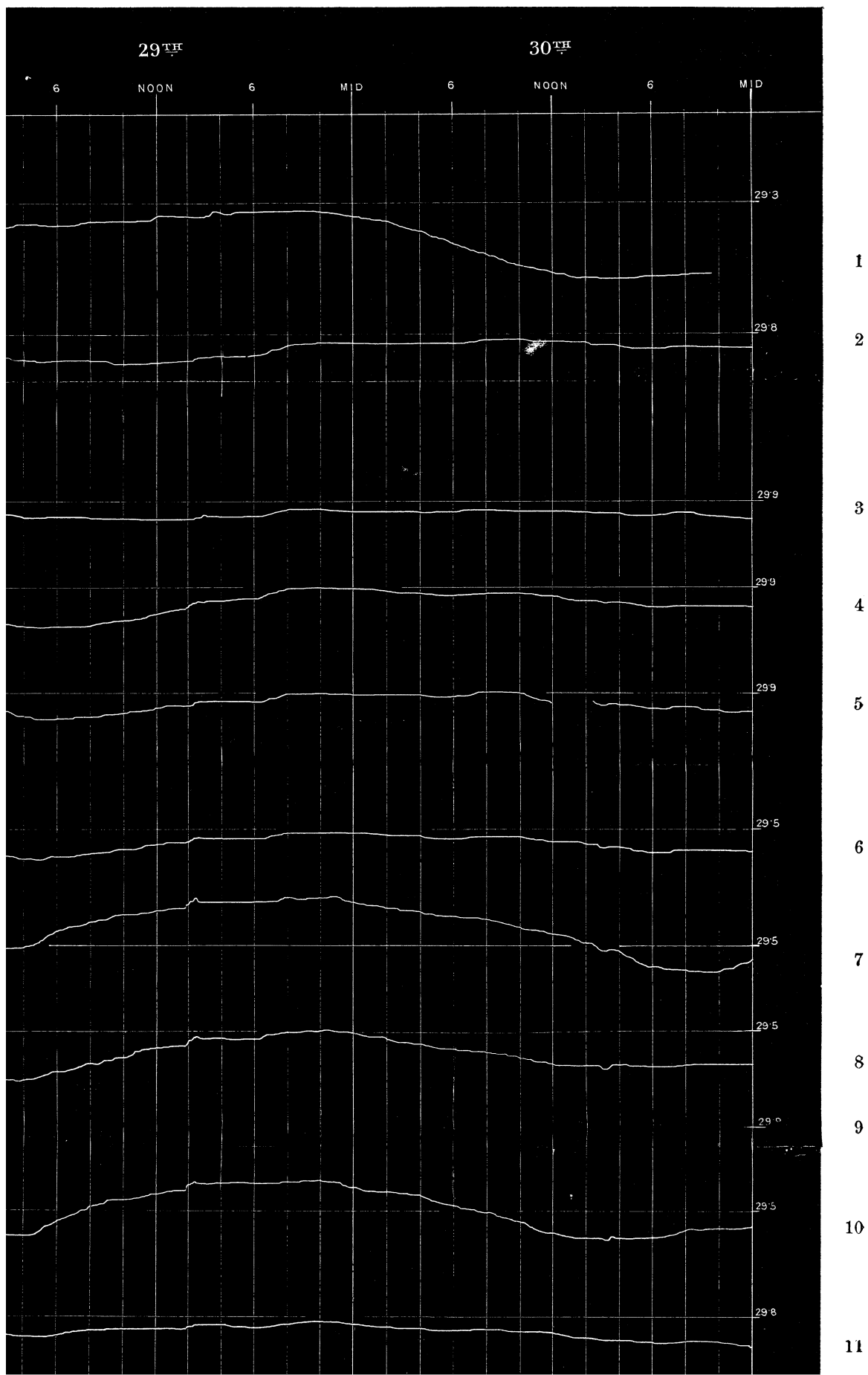
I may conclude by saying that the actual record on the barograms

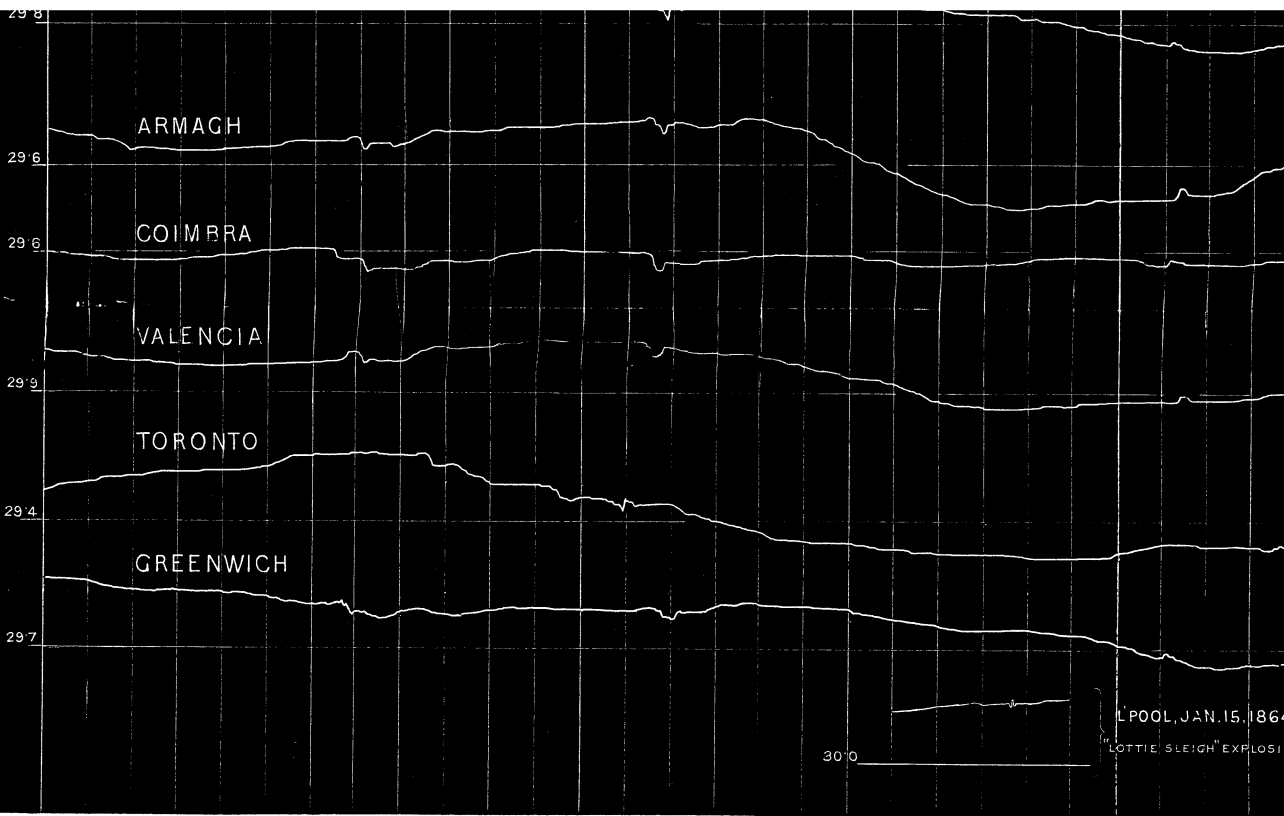
Times of Commencement of the Barometrical Oscillations at the under-mentioned Stations, August 27th, 28th, and 29th, 1883.

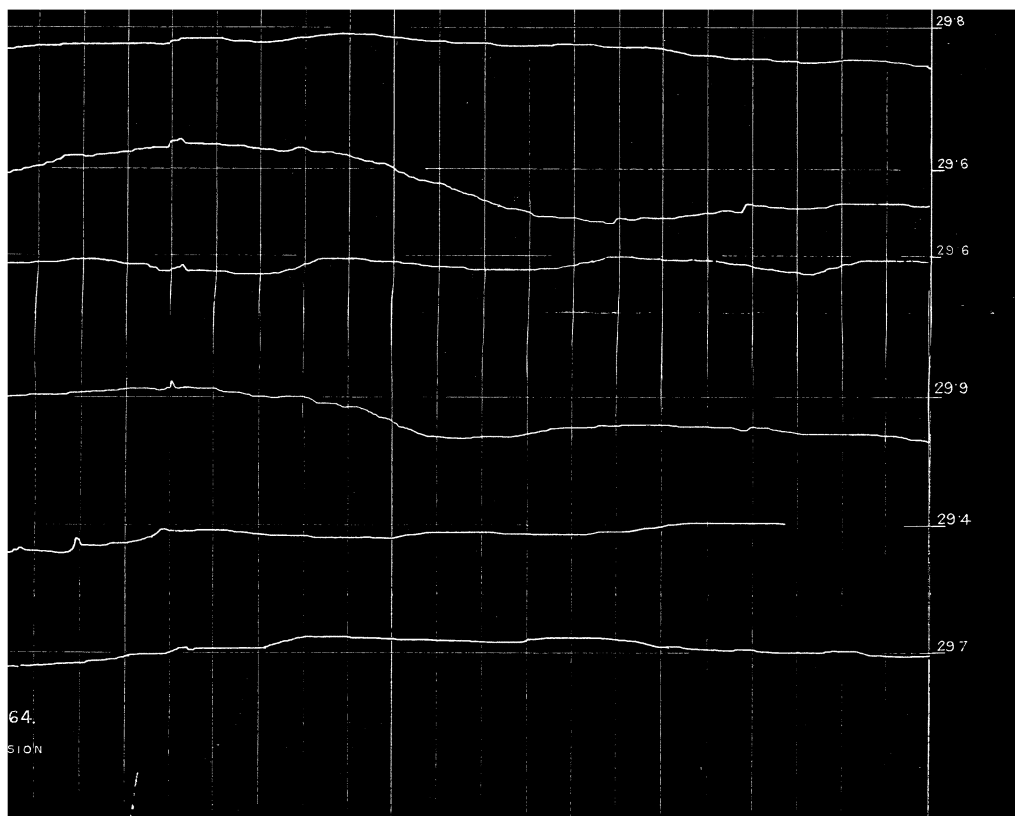
Stations.	(1st.) August 27th.			(2nd.) August 28th.		(3rd.) August 29th.		(4th.) August 29th.		Amplitude of the Oscillation.			
	P.M.	P.M.		A.M.	A.M.	A.M.	A.M.	P.M.	P.M.	(1st.) inch.	(2nd.) inch.	(3rd.) inch.	(4th.) inch.
	(A.M.)	(A.M.)	(A.M.)										
St. Petersburg.....	11 5	11 35	0 0	4 40	5 15	0 20	1 0	3	3 35	0 040	0 024	0 012	0 034
Brussels.....	0 33	0 58	1 30	3 48	4 28	1 43	2 8	2 23	2 43	0 051	0 039	0 039	0 017
Geldeston.....	0 42	1 12	1 40	3 10	4 7	1 40	2 2	2 14	2 44	0 060	0 040	0 035	0 010
Kew.....	0 50	1 10	1 47	3 10	4 5	1 45	2 13	2 0	2 43	0 049	0 051	0 024	0 011
Oxford.....	0 53	1 23	1 50	3 0	3 57	1 55	2 15	1 53	2 40	0 030	0 030	0 015	0 015
Aberdeen.....	1 0	1 25	1 53	3 10	3 52	1 50	2 33	1 53	2 33	0 062	0 052	0 046	0 036
Stonyhurst.....	1 0	1 28	1 55	2 57	3 45	2 0	2 27	1 48	2 33	0 062	0 064	0 029	0 050
Glasgow.....	0 58	1 35	2 5	3 0	3 45	2 10	2 37	1 42	2 27	0 046	0 064	0 050	0 028
Falmouth.....	1 7	1 35	2 12	2 57	3 45	2 5	2 25	1 20	2 28	0 050	0 080	0 030	0 030
Armagh.....	1 13	1 45	2 25	2 53	3 33	2 20	2 45	1 46	2 22	0 049	0 062	0 029	0 036
Valencia.....	1 20	1 48	2 25	2 30	3 20	2 28	2 50	1 27	2 10	0 060	0 070	0 040	0 040
Coimbra.....	..	1 50	2 20	3 5	3 15	2 10	2 15	2 10	2 35	0 066	0 043	0 043	0 043

NOTE.—The figures in antique type indicate a *rise* of the barometer, those in ordinary type a *fall*.









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exhibits considerable similarity to that of the King's barograph at the Liverpool Observatory, at the Waterloo Docks Pierhead on the 15th of January, 1864, when the "Lottie Sleigh," loaded with about twelve tons of gunpowder, blew up. The ship was lying about three miles from the Observatory. I am indebted to the kindness of Mr. Hartnup for a tracing of this interesting curve.

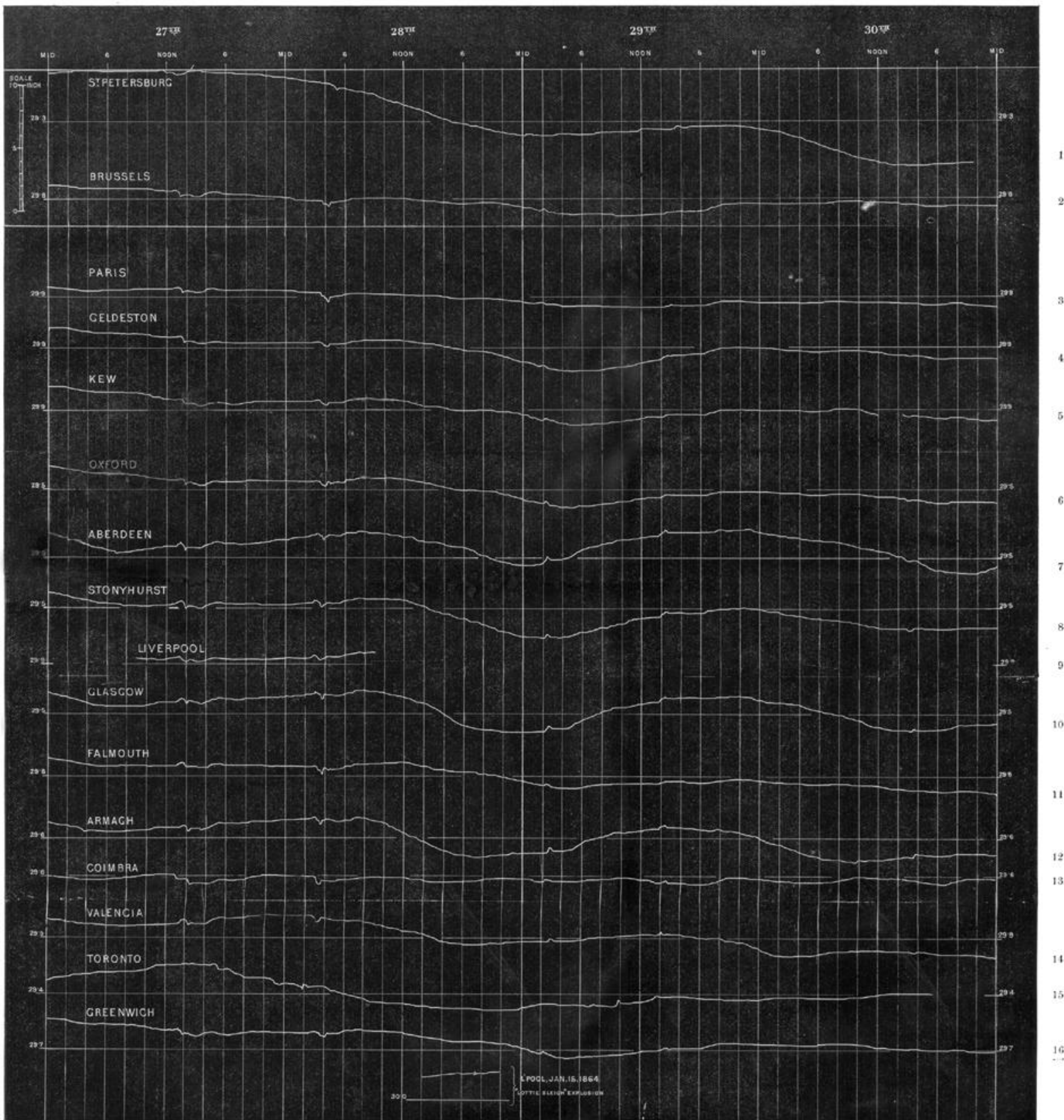
In this preliminary note I can only say that until copies of the barograms from extra-European stations, such as New Zealand, the Havana, and Calcutta, are received, it is impossible to see whether the phenomena so marked in their occurrence in Europe have manifested themselves elsewhere; at Toronto they appear to have been recorded. On that subject I shall hope to lay a future communication before the Society.

## II. Note on the foregoing Paper. By Lieutenant-General R. STRACHEY, F.R.S. Received December 12, 1883.

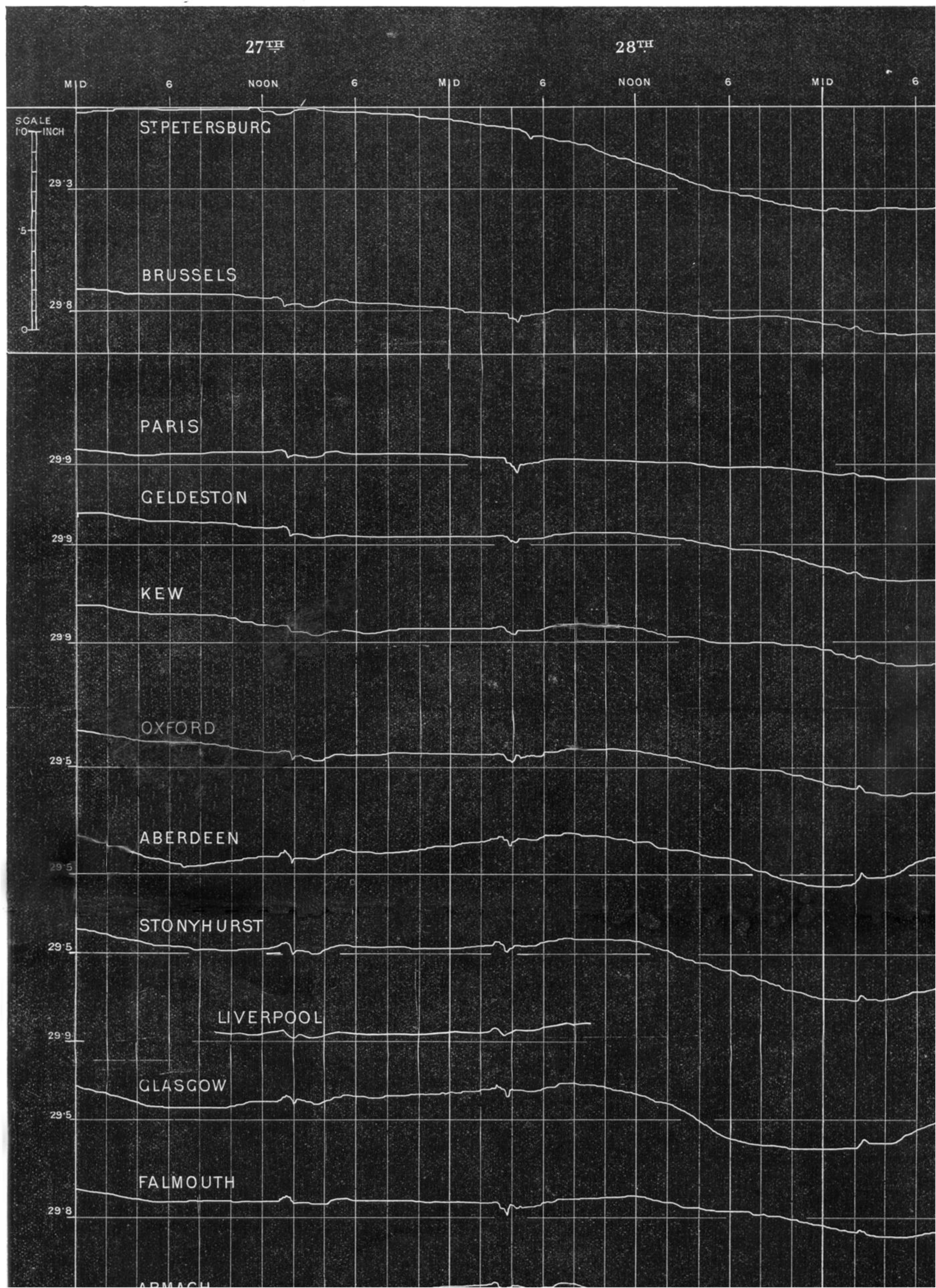
The obvious correspondence of the forms and times of occurrence of the barometric disturbances, described in Mr. Scott's paper, at once suggested that they were due to a common origin, and the great volcanic eruption at Krakatoa in the Straits of Sunda appeared to supply a probable efficient cause. Any shock of sufficient violence might be expected to produce an atmospheric wave, advancing from the place where it was caused in a circular form round the globe, at first expanding until it had got half round the earth, and then again contracting till it was again concentrated at the antipodes, from which again it would be thrown back, and so pass backwards and forwards till it was obliterated. It might also have been expected that such a wave would travel with the velocity of sound, being probably of the same nature as that which causes sound, though the vibrations had not the peculiar character that affects our organs of hearing. It has, however, been suggested to me that the wave may rather have had the character of a solitary wave produced in a liquid, the velocity of which in the air would not materially differ from that of sound.

A rough examination of the facts at first made known by the observations recorded in Great Britain indicated that there was *primâ facie* strong evidence in support of this view, and that the phenomena would be approximately explained by the passage round the earth of a series of waves travelling at the rate of about 700 miles an hour in opposite directions from the place where the volcanic eruption occurred. The records since procured from other places, and the more careful examination of the facts, has quite confirmed this conclusion.

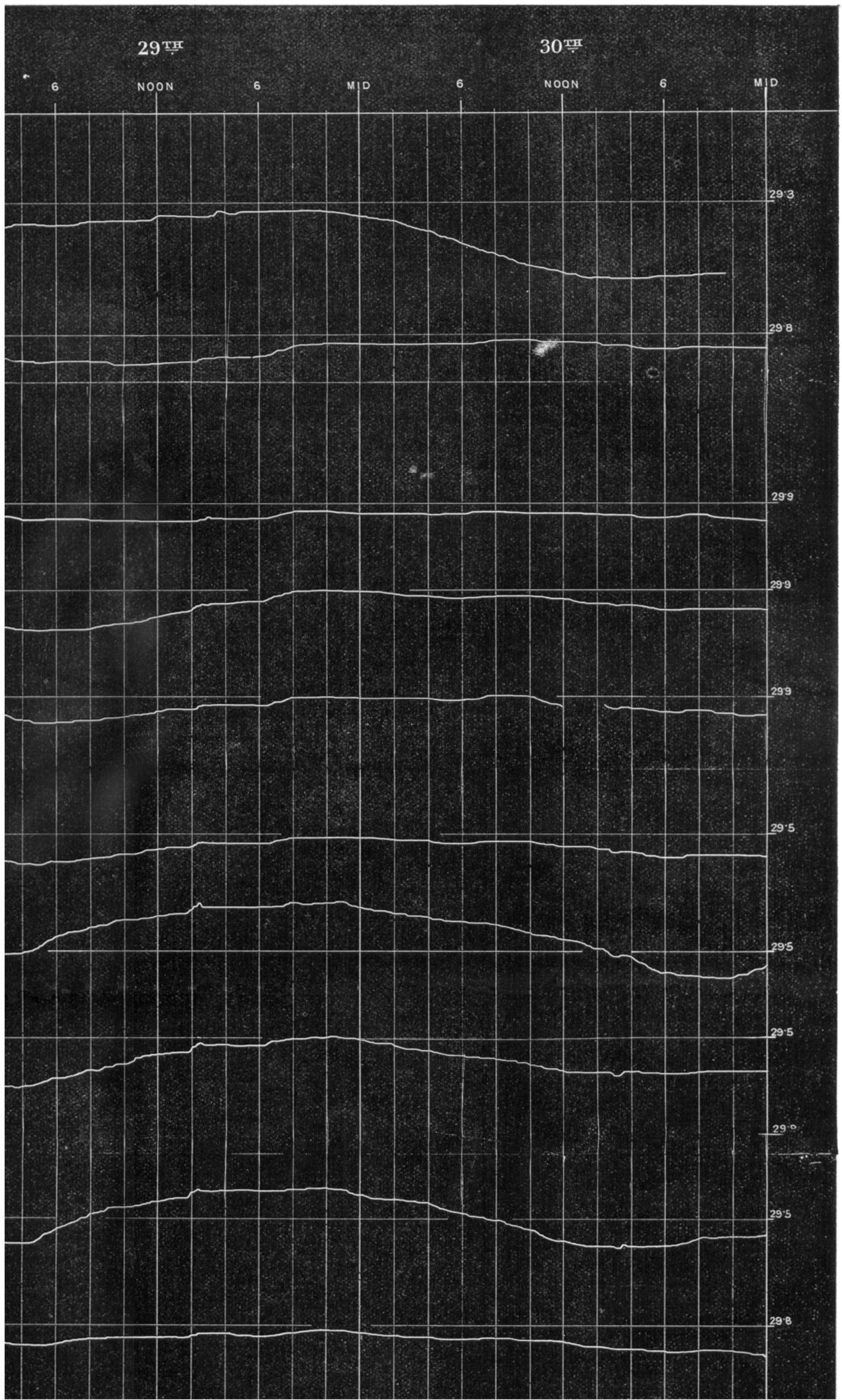
Although we may expect to obtain additional data from other parts



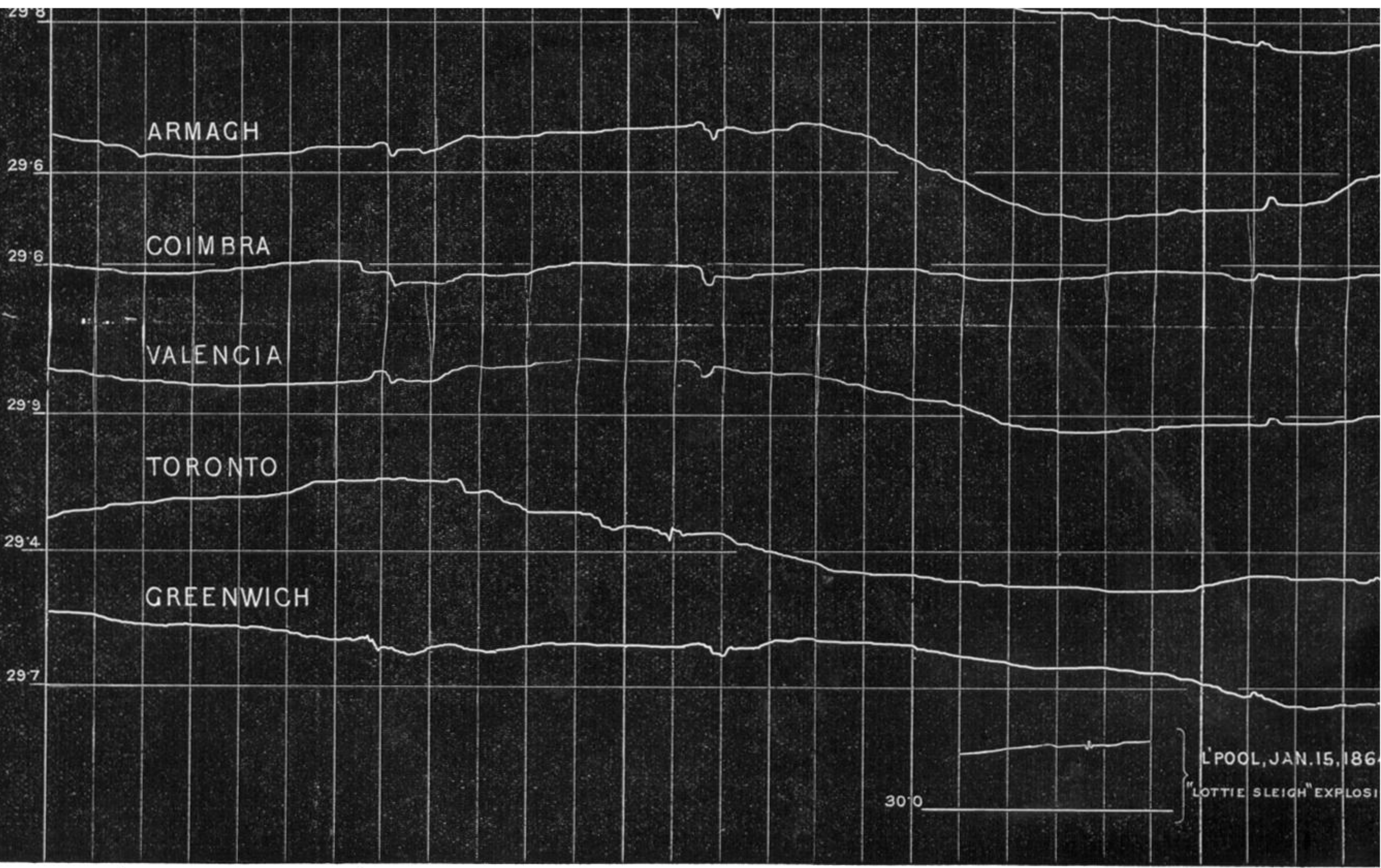




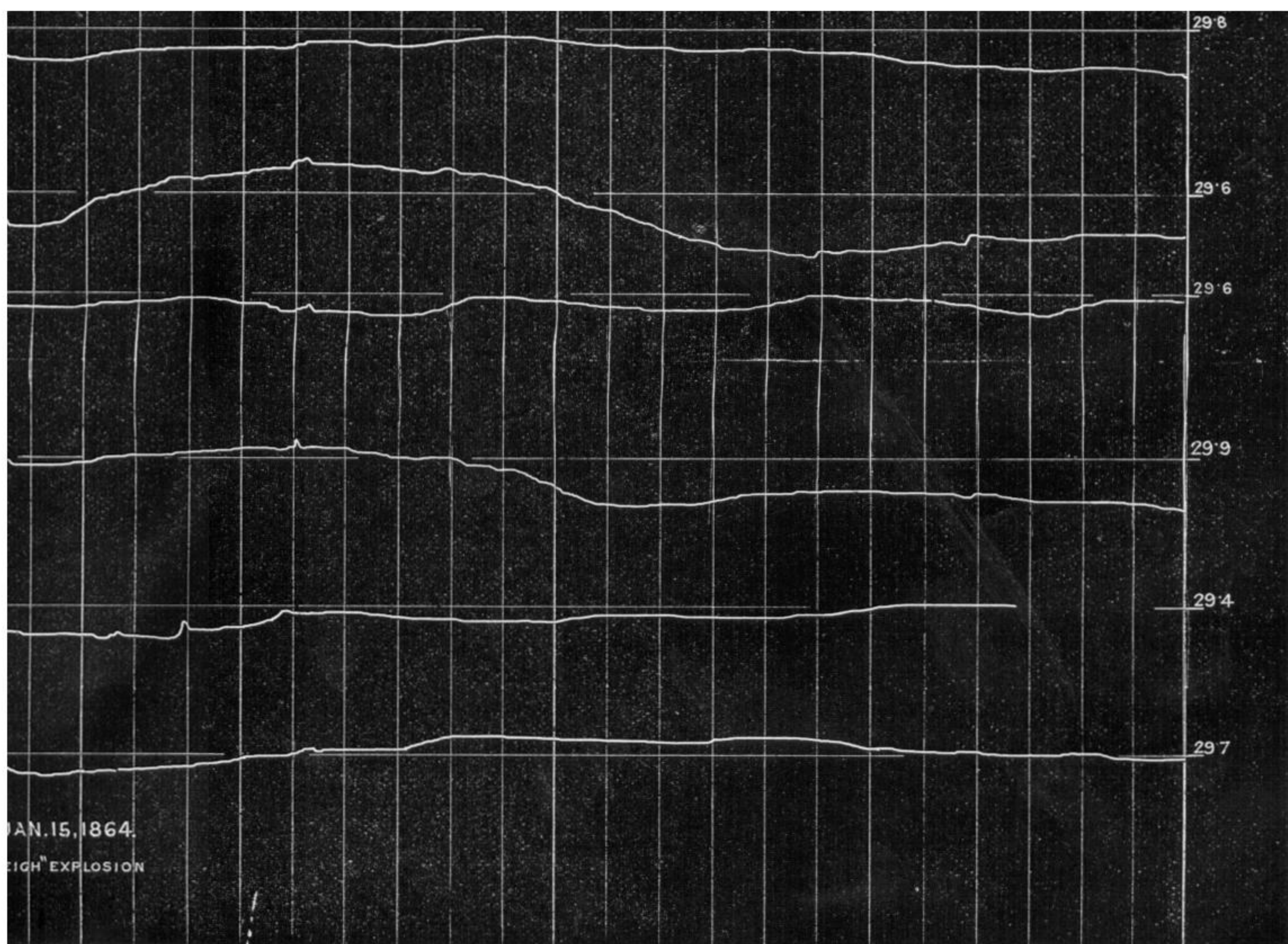












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