

Detonation in Meteorology

A SHORT ACCOUNT OF

The first proposal in England of Artificial Detonation
in the Atmosphere, in 1880, and of subsequent
steps for its adoption,

BY

GEORGE EDWARD TARNER

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DETONATION IN METEOROLOGY.

THE employment of explosives in the atmosphere for 'Rain-making' having become a subject of actual experiment in several countries, as India, Burmah, and America, though as yet, so far as I have heard, no complete series of systematic experiments have been made,* it seems but fair to myself,—as, I believe, the first proposer in England of the employment of Detonation in Meteorology for the purposes of inducing Rain, and (within certain limits) of regulating rainfall, and also possibly (by the disturbance and displacement caused) of dispelling Fogs, as well as the first inventor here of a practical method of applying the principle—to give, as shortly as may be, a narrative of the steps I have from time to time taken to present the subject in a practical shape to the attention of our Meteorologists and Scientists.

In the latter part of 1880 it strongly and independently presented itself to my mind (not having then heard that any one had ever turned attention to the subject) at first chiefly with regard to London fogs, but afterwards, with a more extended view, to the weather generally,—

'That the atmosphere would prove to be the most advantageous field for the beneficial use of artificial detonation, affording the widest scope for its scientific application and action, the primary idea being the employment of small balloons carrying charges of dynamite (or what may be found the strongest and most suitable explosive), their

ascent regulated by conducting cords and discharged at a height where it may be determined the effect would be greatest upon the vapours, with a view to influence to a certain extent the weather and induce rain, and possibly by the displacement and disturbance caused, to ameliorate fog-producing conditions of the air.'

* * * * *

'It will at once be obvious that, should subsequent experiment confirm the soundness of this view, the influence of applied detonation on the weather becomes a subject of the greatest interest and importance. The published records of the earlier period of this year's (1881) harvest brought out in alarming colours the well-known disastrous effects of continuous wet, and the powerless position of the agriculturist before it; but at some future time it may be possible to a certain extent, by means of scientifically applied detonation in conjunction with prognostic meteorology (which has of late made such progress as a science), to intercept the volumes of rain-clouds in their passage across the ocean, and there disperse or discharge them innocuously before their arrival over the land, at any rate, perhaps, in such masses as to produce rain sufficient to cause serious detriment.'

The above is quoted from pp. 4, 5, and 7, of my pamphlet 'Suggestions for the employment of Detonation in Meteorology, by George Edward Tarner.' London, Kerby and Endean, 1881. (Reprinted in Appendix.)

The position I took up was that the subject was too wide for any Patent and too large to be properly developed by private individuals or isolated experiments; and, as possibly having in the future a direct bearing on public health and prosperity, and of universal application, it was a question to be satisfactorily dealt with only by a Government Department or Scientific Society with state resources.

For those who may care to follow the various attempts I have made from time to time (in the midst of other avocations) to gain for the subject the attention of some of our

leading Meteorologists and Scientists, I append the following particulars.

On January 3rd, 1881, I submitted to the Meteorological Society a paper proposing the subject and explaining the method of practically applying it dated December 27, 1880, and styled 'Suggestions for the employment of Detonation in Meteorology,' (embodying what is quoted above), and in a letter accompanying it

'ventured to think that, apart from the question of London fogs, the wider one of possibly influencing the weather as regards rain might not in these days of advancing science prove altogether chimerical';

but on January 20th, the paper was returned to me and I was informed it

'was brought before the Council, but the Referees did not recommend its acceptance for reading before the Society.'

Not being altogether discouraged by this rejection I slightly elaborated my first 'Suggestions' and published them in November 1881 in the form of the pamphlet already referred to.

About this time I was fortunate enough to discuss the subject with Dr. Benjamin W. Richardson, F.R.S., to whom I had submitted my pamphlet, and whose favourable consideration gave me encouragement. Dr. Richardson has always been ready to bring an open mind to bear on the question and his kindly interest and advice from time to time I desire gratefully to acknowledge.

I also in August of the same year gave a copy of my explanatory paper to Mr. Wentworth Huyshe, who was, I believe, on Mr. Gordon Bennett's staff of the *New York Herald*.

In November, 1881, I opened communications with an Explosives Company having large dynamite works, with a view to practical experiments, but without success; and for several

years (my time being fully occupied as managing partner in business requiring constant attention) the matter, so far as I was concerned, remained in abeyance; but not so elsewhere; for in 1886 the theory of 'Rain-making' had come within the province of popular science. In Cassell's *Saturday Journal* of October 30, 1886, Dr. J. W. Green writes as follows:—

‘For the trifling sum of a few hundred pounds and a little systematic work by practical men, any place can have all the rain wanted.’

He then goes on to describe how the rainfall is to be produced by the employment of balloons and dynamite charges in the same manner as explained in my paper of December, 1880, and pamphlet of 1881.

Having regard to this statement, on January 28, 1887, I again approached the Meteorological Society, and after referring to the rejection of my paper by the Referees of their Council in 1881, submitted that as others had since turned their attention to the subject, whether there would now, in the advancing state of Meteorological science, be the same objection to its being considered by the Society as there appeared to be in 1881? But having nothing new to bring forward, I was officially informed that the paper having been already before the Council could not again be submitted; my printed pamphlet was, however, retained in the Library of the Society.

In December, 1887, in an interview courteously accorded me, I was advised by Sir John Lubbock to submit my proposals to the Meteorological Office, a Government Institution distinct from the Meteorological Society, the Council of scientific men under whose direction it is conducted being nominated by the Royal Society, and at that time consisting of Lt.-General Strachey, R.E., F.R.S., Professor G. H. Darwin, F.R.S., F. Galton, Esq., F.R.S., Professor Stokes,

P.R.S., E. J. Stone, Esq., F.R.S., Capt. Wharton, R.N., F.R.S., with Robert H. Scott, Esq., F.R.S., secretary. I accordingly submitted the principle to each of these gentlemen by a letter, enclosing a copy of my pamphlet, and explaining that I desired to bring the subject of the employment of Detonation in the Atmosphere under the notice of leading Meteorologists, and suggesting

‘that the proper and sufficient investigation of so large a subject would seem to come within the province of a Government or Scientific Department,’

but failed to gain for the principle any countenance or support from that scientific body; the secretary, Mr. Scott, closing the correspondence December 22, 1887, by stating

‘I have shown your letter to some gentlemen who have experience of balloon-work. They all say it is utterly unpractical. This is my own opinion too.’

A previous letter however of Mr. Scott, in a slightly humorous vein, enabled me, in reply, to enter somewhat further into particulars (December 20, 1887):

‘I concluded that I had sufficiently indicated the *modus operandi* at page 5 of the pamphlet, * * * but as the subject seems to concern (1) Meteorologists, (2) Chemists, (3) Electricians, and (4) Aeronautical Mechanists, I would submit that if an informal meeting of a few practical men of eminence in these departments could be got together (presuming the theory be so far entertained), they could readily decide on the best manner as to details for conducting such a series of experiments as would prove to what extent the powers and means at disposal would avail for the purpose in view * * *

‘With regard to your second count—as to arrest’ (as dynamiters) ‘that the subject has its comic side I am ready to admit, but so for that matter had steam and other new applications; but the regular use of dynamite in some mines (tin for instance) does not seem to expose the miners to the risk you named. No doubt Justice is blind-

fold, but she could make out enough to save confounding us with the scoundrels that have contrived, in another direction, to give dynamite so sinister a notoriety. Besides, you may note at page 5 that it need not be dynamite that is employed at all, but "what may be found the strongest and most suitable explosive." I must not enlarge on a natural result, should success be attained, viz. the creation of a staff of practical detonators would be required to supply the various Meteorological stations.'

* * * * *

To this letter was annexed a rough diagram showing a possible arrangement of balloons and detonating gear. (Reproduced in Appendix.)

Concurrently with the application to the Meteorological Office, I submitted my pamphlet to Professor Tyndall, F.R.S., Sir Frederick Bramwell, F.R.S., and Sir Douglas Galton, F.R.S. Professor Tyndall, apparently only regarding its possible bearing on fogs, replying

'Could detonation be proved to have the effect which you think it produces, it would be a beneficent result for London. But I confess my inability to understand how it could have such an effect.'

In 1891 the principle of applied detonation in the atmosphere had become the subject of actual (and it would appear successful) experiment (though not in England), being matured into a working shape on practically the same lines as proposed and explained by my paper of 1880 and pamphlet of 1881.

By the courtesy of Sir Julian Pauncefote, H. M. Ambassador to the United States, a communication from the Department of State, Washington (dated March 19, 1891), has been handed to me in answer to my enquiry as to the subsidy granted by the U. S. Government for conducting experiments in the production of rainfall. It states

'The present movement relative to the experiments of

which Mr. Tarner speaks, is doubtless the outgrowth of an appropriation for the Department of Agriculture for the current year ending June 30, 1891, for which the sum of 2,000 dollars has been appropriated. I am advised that a contract has been made by that Department with a patent-lawyer, formerly Deputy-Commissioner of Patents, Mr. R. G. Dyrenforth, to make experiments, and that he is already negotiating with a practical balloon maker and expects to make the experiments probably during the month of June in this year. It may be added that 7,000 dollars more for the same purpose is in the Appropriation bill for the next fiscal year ending June 30, 1892, and the contract for the expenditure is likely to be given to the same gentleman.'

The communication goes on to state that Mr. Daniel B. Ruggles, of Virginia (who had the year before memorialized Congress on the subject), obtained from the Patent Office of the United States July 13, 1880, letters patent 'covering all plants and devices for the production of rainfall by explosives of all kinds, dynamite included, in the air,' while my paper of December 27, 1880, proposing the principle and explaining the method of practically applying it (viz. by small balloons carrying charges of dynamite or most suitable explosive, their ascent regulated by conducting cords and the charge exploded by electricity), was submitted to the Meteorological Society, in London, January 3, 1881; thus at practically about the same time we both independently arrived at the same conclusion in different hemispheres—a parallel case to some astronomical discoveries independently made simultaneously or thereabouts by astronomers in different countries.

Early in 1891 Dr. B. W. Richardson, in writing a series of letters to the *Daily Graphic* 'on London Fog,' referred at some length to detonation for its suggested clearance, under the name of 'the Tarner Plan.' (Vide *Daily Graphic*, March 4, 1891.)

It only remains for me to notice some recent extracts from the *Times* referring to actual experiments which have been

made with various degrees of success, premising that they in no way represent such a complete series of systematic experiments as I hold to be necessary to establish the success or failure for practical purposes of the principle proposed.

Times, Nov. 16, 1891. Madras, Nov. 15.

‘Several rain-making experiments on a small scale have recently been tried in various parts of the Madras Presidency by private agency. They have been partially successful, and it is possible that further systematic trials may be instituted by the Government. Explosions of dynamite on the summits of hills at an altitude of from 500 feet to 600 feet above the plains, affecting an area of about four or five miles radius, inducing smart showers. The experiments are of especial interest in regard to the question of the practicability of arresting clouds which, in the dry season, pass over the coastal districts and discharge their contents a few miles further out at sea.’—Reuter.

Times, Nov. 23, 1891. Rangoon, Nov. 22.

‘In Upper Burmah rain-making experiments have been begun by Lieut. Pilcher, R.E. His second experiment, on a hill about 1500 feet high in the Yemethin district, with two heavy charges of gun-cotton of 30 lbs. and 40 lbs. each, was followed by rain, although the sky had been cloudless before. Orders had been despatched by the Chief Commissioner to try heavy explosions of any substance available, gunpowder, dynamite, or gun-cotton, throughout all the bad districts. There is moisture enough in the air in Upper Burmah if it can be shaken out.’

‘The *Rangoon Times* of yesterday announces that a heavy rain, apparently extending over a wide area, has been falling in Yemethin, which is one of the worst districts. In Lower Burmah, where rain is much wanted in several districts, a steady and general rainfall has occurred.’

Times, Nov. 26, 1891. Calcutta, Nov. 25.

‘The rain-making experiment at Bellary, like that at Bezwada, has proved a failure, but on both occasions a

high wind was blowing; and it is believed, from the evidence obtained, that a steady ascent of smoke is essential to success.'

Times, Nov. 30, 1891. Rangoon, Nov. 29.

'The rainfall was so general, and it extended over such a wide area, that it is difficult to attribute it to the recent rain-making experiments, although they doubtless intensified it in the localities where they took place. Lieut. Pilcher has proceeded to Yen and Shwebo to repeat the rain-making experiments in those districts.'

Times, Dec. 16, 1891.

'Successful Rain-making Experiments in India.—According to the *Times* of India, Mr. Wolfe-Murray's rain-making experiments in Madras have been attended by a success so remarkable as to suggest the occurrence of a singularly fortuitous coincidence rather than a triumph of science over nature. The centre chosen for the experiment was Cuddapah, where the rainfall is always scanty, and, neither kites nor balloons being available, the dynamite was placed on a ridge of flat rocks 2,400 feet above the sea-level and a couple of hundred feet above the plain. A hundred pounds of dynamite was used in all, ten packages of ten pounds each being ranged on the rocks at intervals of sixty yards, and fired by time-fuses at intervals of one minute. Nine of the packages were successfully exploded, and six hours later, while the sun was still shining, there came a magnificent shower of rain, such, it is stated, as has hardly been experienced in the district during the present year. The shower lasted half-an-hour, and was confined to the region affected by the explosions, which Mr. Wolfe-Murray deems a conclusive proof of the success of the experiment. As the total cost was only 200 rupees, it will not be a difficult matter to verify these conditions in other districts.'

Times, Dec. 27, 1891. Calcutta, Dec. 27.

‘Several attempts at rain-making by dynamite explosions have failed, and a good deal of correspondence is now going on in the Indian papers on the question whether any real success is to be hoped for in that way. The general result of experiments in various parts of India appears to be that success is improbable unless the atmosphere is already heavily charged with moisture’ (i.e. it will not work miracles): ‘but some persons maintain that no thoroughly conclusive trial has yet been made; and that, even when the conditions are apparently unfavourable, rain may be produced by exploding dynamite at a great height in specially-contrived balloons.’

All the above may be considered as rough experiments with but little in the way of suitable appliances; and whatever measure of success may have been attained would appear to be due to the soundness of the principle itself, without any refinement in its application by means of specially constructed apparatus as described in my paper of December 27, 1880, and subsequent pamphlet of 1881.

I forbear to comment on the facts adduced in this narrative, leaving them to speak for themselves; and give below, in an Appendix, a reprint of my pamphlet of 1881 and also a reproduction of the rough diagram which accompanied my letter (quoted above) of December 20, 1887, showing the method of working explained in the pamphlet.

APPENDIX.

Reprint of 'Suggestions for the employment of Detonation in Meteorology by George Edward Tarner. London, Kerby and Endean, 1881.'

AMONG the special characteristics of this latter part of the present century, as compared with those of the period immediately preceding it, none are probably more remarkable than the rapid strides which have been and are being made in electrical and chemical science; of many of the more important and practical applications of which it may be safely predicated that results have been obtained and become part-and-parcel of our everyday life, which would have been regarded simply as impossibilities a comparatively few years back, and the serious belief in their attainment would have been held by sensible people as a sufficient passport for the interior of a lunatic asylum; yet now the most startling applications of science to common uses become, from their frequency, commonplace, and are accepted by all as if the time had never been when they were not. And this is just in accord with that law of progress which holds everywhere: what is only perceived by one generation is practised by the next.

With these thoughts before us, I would introduce the subject of the present remarks, viz., the proposed employment of Detonation in Meteorology,—a putting to a beneficial and practical use those powerful explosive combinations which the chemical science of the day is elaborating;—and in doing so would submit these outline suggestions with the greatest deference to scientific men and those better qualified to speak on the subject than myself.

In the latter part of last year (1880) it occurred to me (at first chiefly with regard to the subject of London fogs, but afterwards with a more extended view to the weather generally) that the atmosphere would prove to be the most advantageous field for the beneficial use of artificial detonation, affording the widest scope for its scientific application and action; the primary idea being the employment of small balloons, carrying charges of dynamite (or what may be found the strongest and most suitable explosive), their ascent regulated by conducting cords, and discharged at a height where it may be determined the effect would be greatest upon the vapours, with a view to influence, to a certain extent, the weather and induce rain, and possibly, by the displacement and disturbance caused, to ameliorate fog-producing conditions of the air.

In support of this view may be adduced the notices recorded (but, from the circumstances, necessarily without scientific obser-

vation) of the influence the concussion of the cannonade in some general actions (though at the earth's surface) has had on the weather in their neighbourhood; and though how far it may be practicable, with the means at present at command, to produce artificially sufficient disturbance to give beneficial or even appreciable results, can, of course, only be determined by series of direct experiments; still, as chemists assure us, the limit of the ultimate capacity of matter for the accumulation of explosive force is very far from reached by the strongest combinations at present in use. If the theory here advanced be sound, there is apparently no absolute reason why the results aimed at may not be obtained, if not immediately, at least at no very distant date.

Undoubtedly a fear of the serious mischief which might result from the perverted or careless use of these great powers tends (and very reasonably) to act as a deterrent from their general employment, or even from the publication of the formulæ of their composition; but it must be remembered that the man of science in the explorations of his proper province must be afraid of nothing legitimately resulting from his researches, and must leave the regulation or restriction of the use of his discoveries (where necessary to social convenience) to the political man, as representing another province, on which his own does not trench.

These great explosive forces then, which it is useless to ignore, while they seem just now to present to the perverted human will only a means for enhancing man's destructive powers, still must be regarded as affording a prospect of the equally mighty beneficent power which their employment may confer on him, when these forces and their true application come to be better understood; for as man hitherto has chiefly operated for his benefit upon things below him, that is, on the earth's surface, or a comparatively small distance beneath it, so in these days of advancing science, there is no reason for it to be thought chimerical that his operations should, in the future, be successfully extended to include within their scope a beneficial action on the atmosphere and its vapours above him, by means of explosive agents.

It will at once be obvious that, should subsequent experiment confirm the soundness of this view, the influence of applied detonation on the weather becomes a subject of the greatest interest and importance. The published records of the earlier period of this year's harvest brought out in alarming colours the well-known disastrous effects of continuous wet, and the powerless position of the agriculturist before it; but at some future time it may be possible, to a certain extent, by means of scientifically applied detonation, in conjunction with prognostic meteorology (which has of late made such progress as a science) to intercept the volumes of rain-clouds in their passage across the ocean, and there disperse

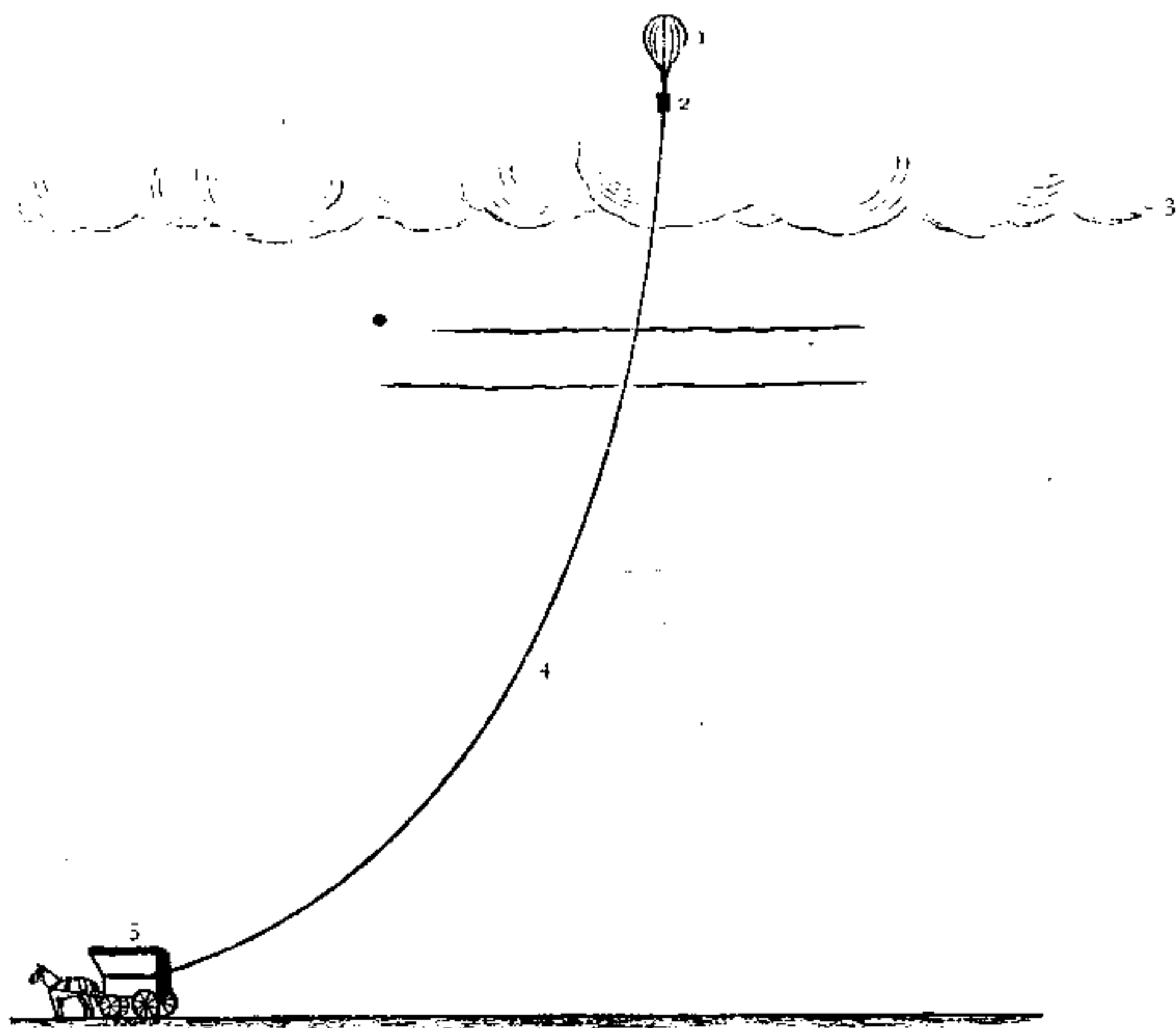
or discharge them innocuously before their arrival over the land, at any rate, perhaps, in such masses as to produce rain sufficient to cause serious detriment.

The general problem of the advantageous employment of detonation in the atmosphere remains to be worked out; and though probably it may be laughed at by some as a kind of 'cloud-compelling,' it may reverently be maintained that He who made the worlds, and foresaw all the working-out of His own laws, has provided, through the discovery of the more powerful explosives of our time (though, like other things, open to man's abuse as a responsible agent), just the means most suitable for the requirements of the times of their discovery.

Copy of Diagram annexed to Letter of Dec. 20, 1887,

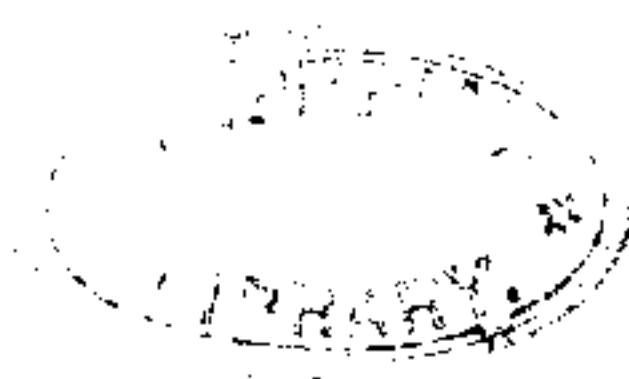
(quoted above, page 7).

Very rough Diagram of possible arrangement.



1. Small inexpensive balloon.
2. Explosive charge.
3. Clouds.
4. Conducting cord regulating height of balloon.
5. Operator's van, carrying electric battery and reserve of small balloons (ready filled), explosive charges, &c.

The line of direction and altitude being arranged according to clouds, weather, &c., the van could be moved to several points for successive detonations. (Possibly, by flying the balloon sufficiently high and suspending the charge, its destruction and the fall of the conducting cord might be avoided.)



APPENDIX II.

THE official Report of the experiments made for the United States Government referred to in foot-note inserted at page 3 ('Senate, 52nd Congress, 1st Session. Letter from the Secretary of Agriculture, transmitting a Report of the Special Agent of the Department of Agriculture for making experiments in the production of Rainfall. Washington: Government Printing Office, 1892'), gives on page 58 the following deductions from the results of the systematic experiments reported.

'First. That when a moist cloud is present, which, if undisturbed, would pass away without precipitating its moisture, the jarring of the cloud by concussions will cause the particles of moisture in suspension to agglomerate and fall in greater or less quantity, according to the degree of moistness of the air in and beneath the cloud.

'Second. That by taking advantage of those periods which frequently occur in droughts, and in most if not in all sections of the United States where precipitation is insufficient for vegetation, and during which atmospheric conditions favor rainfall without there being actual rain, precipitation may be caused by concussion.

'Third. That under the most unfavorable conditions for precipitation, conditions which need never be taken in operations to produce rain, storm conditions may be generated and rain be induced, there being, however, a wasteful expenditure of both time and material in overcoming unfavorable conditions.'



DETONATION IN METEOROLOGY.

Famine in India.

‘THE Indian food-supply being so largely dependent on normal rainfall,—

* * * * *

‘—in the event of Her Majesty’s Government becoming satisfied with the practicability of the system, India, or such parts of it that are liable to famine through drought, might, after due deliberation and in consultation with meteorologists on the spot, be mapped out into districts and centres chosen as dépôts, whence practical detonators could proceed to the localities where their operations would be advantageous.’

*(Letter to LORD GEORGE HAMILTON, Secretary of State
for India, January 5, 1897.)*

Lord George Hamilton replied informing me he had communicated my pamphlet to the authorities in India, January 22, 1897.