Ben Nevis Observatory and the Argentine Republic.

NEWS has reached me here from the office of the Scottish National Antarctic Expedition in Edinburgh of the appointment of almost the whole of the Ben Nevis Observatory staff to the Argentine Meteorological Office, including the superintendent, Mr. Angus Rankin, who has been associated with the observatory for more than twenty years, Mr. Robert Macdougal, for many years assistant, and Mr. Bee.

It may be remembered that in March, 1903, the Scottish National Antarctic Expedition set up a first-class meteorological and magnetical station in the South Orkneys, at Scotia Bay, and that, after the wintering of the *Scotia*, I offered to hand over the station, including Omond House and Copeland Observatory, to the Argentine Government with eighteen months' provisions, as well as to give a passage on board the *Scotia* to Argentine men of science if the Republic would undertake to continue the work and relieve the party the following year. This was carried through by the energy of Mr. Walter G. Davis, director of the Argentine Meteorological Office, and Mr. Robert C. Mossman, the Scottish expedition's meteorologist, was asked to continue in charge. Now Mr. Mossman has returned after two years' valuable work in the Antarctic, and the station is being kept up a third year—the first time in the history of Antarctic exploration that scientific observations have been carried on in one place for more than two years.

But the Republic is not satisfied; it is to continue the work for still another year, and is even going to increase the number of Antarctic stations. Trained men were required, and since Mr. Mossman's return he has been in communication with Mr. Davis, with the result that these three gentlemen have been appointed to carry on this work, as well as Mr. W. R. Bruce, also of Ben Nevis Observatory, who arrived in Buenos Aires three weeks ago.

The Argentine Republic must be congratulated on its enlightened perspective; but surely while doing so we must hang our heads in shame, for, while our Government has discouraged scientific research, we find this rapidly rising Republic eager to encourage it.

WILLIAM S. BRUCE.

Eggishorn, Switzerland, September 8.

Properties of Photographic Plates Exposed to Light.

IN May, 1904, I exposed an ordinary sensitised ¼ plate (20th Century Rapid) to daylight. It was so placed that the light had to pass through a window before falling upon the plate. The day was cloudy and dull, without sun, and the time of exposure was from two to four p.m.

In the meantime I placed an unexposed plate in a box, and upon it a steel pair of scissors. Then taking the exposed plate I placed it above the unexposed plate with the scissors in between and in contact with the sensitised sides of both plates.

After closing the box and wrapping up to exclude light, I put it away for six weeks.

At the end of this period I developed (with MQ) the unexposed plate, and found, as I had hoped, a radiograph of the scissors; then developing the exposed plate it appeared, if anything, to be less dark than the unexposed plate, but without any image.

During 1904 I repeated the experiment several times, varying the time of exposure and letting the light pass through thicker glass, also developing at shorter intervals, the days in every case being cloudy as in the first case. With one slight exception, I failed to obtain any result.

This year I put down three other pairs under the same conditions as the first experiment of 1904, but, if anything, the day, though cloudy, was much brighter. With these I obtained three good results, one of which I unfortunately spoilt in developing.

At present I have five or six other pairs which will be ready for development in four or five weeks' time. In these cases the day was bright sunshine, so that perhaps better results may be expected. L. H. WINN.

Coombe College, Luton Road, Harpenden.

CAUSE AND PREVENTION OF DUST FROM AUTOMOBILES.

AT the present time by far the most serious problem which the automobilist has to face is the abatement of the "dust nuisance." A great deal of bad feeling has arisen against the motorist on account of the dust which he too frequently produces, and there is no doubt that there are very good grounds for the irritation which has arisen, more particularly in agricultural districts. Farming in this country, at the best of times, is not in a prosperous condition, and a farmer does not view with any kindly eye a further reduction in his produce through the effects of dust. Apart from that, however, dust may cause a great deal of personal discomfort to other users of the roads; but this phase of the question would, perhaps, not require very serious consideration were it not that dust of this nature is apt to carry disease, and to lower the health of the poorer part of our population living along the main thoroughfares. As such matters may lead to serious opposition to automobilism, and possibly to further legal restrictions, all tending to hamper a growing and very important industry in this country, it is becoming imperative to see what can be done to minimise a nuisance of this kind.

At present there are two distinct methods of tackling the problem. One is to treat the roads, or construct them, in some way so that they no longer give rise to dust. The other is to so alter the construction of the car that dust, if it exists, will not be raised to a serious extent. These two methods we will now consider.

(1) *Special Treatment of the Roads.*

Undoubtedly proper treatment of the roads, if something permanent and at the same time not costly could be devised, would be the most effective solution of the problem. If, for example, the surface could remain moist, there would obviously be no dust. But treatment with the ordinary watering-cart is very transient; moreover, it is destructive, for the water, as a rule, is used in excess. The use of a deliquescent substance, such as calcium chloride, naturally suggests itself. But in order to be effective the solution would have to be above a certain strength, and probably a little wet weather would remove so much of the deliquescent material that re-treatment would be necessary very soon.

A number of solutions are now on the market for the more or less temporary treatment of roads. Perhaps the best known is Westrumite, containing chiefly petroleum and ammonia, the product being completely miscible with water. It has been used extensively as a temporary measure. Experiments by the Scottish Automobile Club show that the effect remains for a considerable time. Three stretches of road, each about half a mile in length, comprising metalling in three different stages of wear, were selected. These were thoroughly cleaned and treated with a 10 per cent. solution of Westrumite. This was repeated after three days, and, as very heavy rain fell soon after, a solution of the same strength was applied a third time. The result appears to have been very satisfactory. Absolutely no dust was raised by vehicles of any description passing over the road for a very considerable time after the application, and even after three months the dust was nothing to speak of. On the metalling that had been worn the dust was found to be greater. The permanency of the result probably depends on the amount of traffic, as results elsewhere have not always been so satisfactory.

Other preparations of a similar character have

been devised, such as Akonia and Dustroyd. The latter is a liquid manufactured from tar, and as it is not soluble in water it should have the advantage of greater permanence, being less affected by rain than are soluble preparations. It is said to give an asphaltic surface to the roads.

A more permanent style of treatment is by means of oil. So far this method has not received much attention in this country, but in America it is being tried on an extensive scale. This is the case at Los Angeles, Cal. The secretary of the Chamber of Commerce of that city gives the following details in a report on the subject:—

"For the past four or five years the use of oil on our roadways has been increasing rapidly, and is now considered the best method for laying the dust, as well as of making a serviceable roadway. It has been taken up by the different boards of supervisors in the surrounding counties as well as by the superintendent of streets in Los Angeles, and we have now in the neighbourhood 300 or 400 miles of oiled roads within a radius of 60 miles of the city. It has been found, when properly applied and the necessary attention given to it, that it forms a smooth durable surface; and in one case of a road with a 6 per cent. grade treated with oil, it was found after a heavy rainstorm the road had not cut or washed, but on a road in the same neighbourhood under the same conditions not treated with oil it became impassable.

"The process of preparation varies considerably according to the opinions and experience of the different workers, as well as with the different material of which the road bed is composed. Some officials have claimed that a very sandy road would not be benefited with oil, but by repeated experiment it has been found that by putting on a very heavy coat of oil the loose sand has taken it up, and by continual application a very fair road bed has been made out of what was almost impassable sand. In some instances sandy roads have been first crowned up with a heavier soil or with clay, making a firm foundation, and then treated with oil, thus making as good a road as in other sections where the land is heavier. In some localities, where oil has been used for some time and careful attention given to repairs and renewal, the roads have become as smooth and hard as asphalt pavements and without the disadvantage of dust. In preparing an ordinary road, in some instances the surface has been loosened by a machine carrying something in the nature of a rake, for the purpose of being able thereby to mix the oil with the surface dirt. In others where the soil is heavy and packed hard, it has been covered with oil and then a thin coating of light sand is sprinkled over this, which causes the whole to cement together, forming a hard surface. For roads of this nature, that is, with a hard surface, it has been found preferable in many cases to use a light gravity oil, which is absorbed readily by the earth. In cases of light or sandy soil, it is contended by many that the heavier oils carrying more asphalt in their composition are more desirable and more effectual for the purpose.

"It is a hard matter to give any definite figures as to the cost of treating the roads, for the reason that conditions differ and prices of material vary in the different localities; but from the figures given by some of our supervisors it seems that it takes from 75 to 250 barrels of oil per mile for the first treatment, according to the character of the soil. About one-third of the original amount is sufficient for the second year, and thereafter in constantly decreasing amounts. It is stated that the average cost, taking the first application and the later attention, should not exceed 20*l*. per year per mile. It is authoritatively claimed that treatment by oil is much less expensive, even at the outset, than the use of water in laying the dust, and at the same time is enduring."

Mr. Lyle Rathbone, in a paper read before the Liverpool Self-propelled Traffic Association this year, gives an account of experiments with oil carried out on the roads at Liverpool. The oils used were hot and cold creosote oil by itself, creosote oil mixed with small proportions of pitch, resin, or tallow respectively, hot coal tar, cheap waste oil from coal tar, common petroleum, and crude Texas petroleum. The general results do not appear to be anything like so permanent as those obtained in America referred to above. They were satisfactory as far as they went, the tendency being for the road surfaces to be preserved, to dry more quickly, and to be cleaner. No very conclusive result as to the best oil seems to have been reached. Creosote oil with resin gave the cleanest and best appearance, and ordinary petroleum was the least lasting. Heavy coal tar waste oil lasted longer than creosote, and was very much cheaper; a single coat kept the surface in good order for about three weeks, and two coats for about five weeks.

Experiments by the Scottish Automobile Club showed that crude oil was most effective. It was poured on to the cleaned road surface by means of cans, and brushed over so as to saturate the surface uniformly. In about twelve hours the surface was dry enough for traffic. The cost per mile of road of fair average width was about 20*l*., which may seem costly, but the method has the great advantage that a single application is sufficient for a season, and against this cost must be set a saving in other ways. It is to be hoped that more extensive experiments

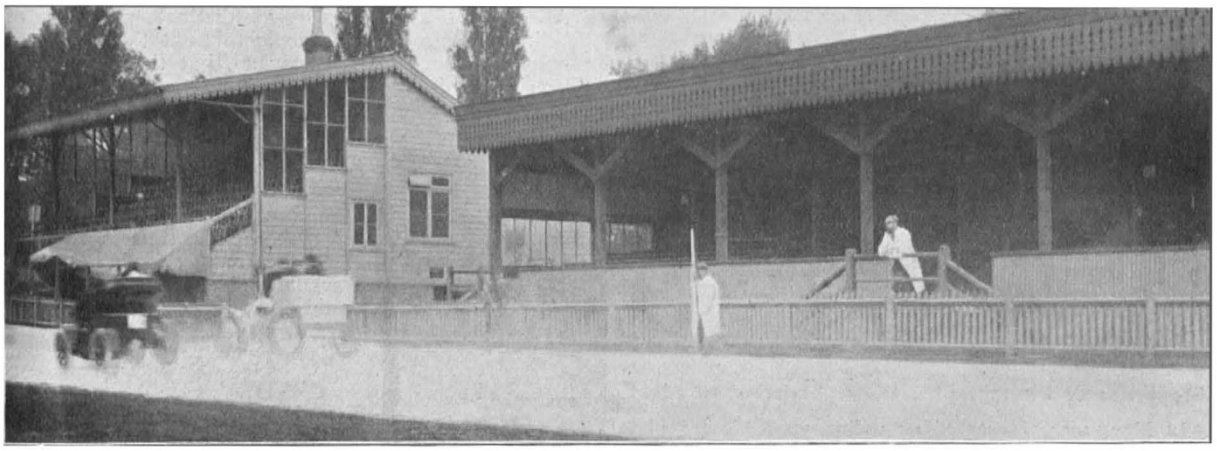

FIG. 1.—Test of a dustless car running over flour at the Crystal Palace. From the *Automobile Club Journal*.

will be carried out on these lines, for the results seem rather contradictory, and there are probably a good many factors to be observed.

In the methods so far referred to, attempts are made to improve the roads with their present mode of construction. But it would be more rational to use materials in road-making that would not give rise to dust; for example, with materials of a viscous nature. Tar very naturally suggests itself, and a good many experiments have been made either by mixing it with road materials or by applying it hot as a coating. Mr. Scott Montagu, in a paper recently read before the Automobile Club, gives several instances in which the tarring of roads has proved effective. It is perhaps a little early to say whether this treatment remains satisfactory under all conditions, or whether it may after a time give rise to unpleasant mud in wet weather under certain conditions.

In order to obtain a permanent result it seems necessary that the crust of the roadway should be really waterproof to a fair depth, so that dust-forming materials cannot work up. This result can only be obtained by combining the tar with the materials used in construction. It is useless, however, to tar such materials as granite or syenite, because the tar remains only on the outside, and as the material is worn the tar becomes ineffective. For that reason Mr. E. P. Hooley uses furnace slag, which is very porous, and produces a material which he has named "Tarmac." The slag is taken hot from the furnaces, broken, and thrown into tanks of tar. Upon cooling, the tar becomes absorbed, and the slag is thoroughly impregnated, so that if the pieces are broken further a tarred surface is still found. In other words, the material is such that it cannot give rise to dust. It is used in construction, like other materials, to a depth of several inches. The initial cost is rather heavier than for a macadam road, but this appears to be more than counterbalanced by the greater durability and the fact that a waterproof road is obtained free from dust and requiring much less cleaning than the usual macadam.

(2) *Design of the Car.*

Although a permanently good road may be made by the use of such materials as Tarmac, and dusty roads may be cured temporarily by various means, yet such measures can be taken only over a small proportion of our roads owing to the cost. In towns and large villages the roads might be suitably treated; but the average motorist seeks the country, and the greater part of the routes which he wishes to traverse will not pay for any special treatment. It therefore becomes very important to modify the design of cars so that the dust raised may be reduced to a minimum, and also, if possible, to find some simple means of checking the dust in the case of cars already in use.

One of the simplest defects to remedy is the direction of the exhaust, which is sometimes pointed downwards. In such a case the dust raised by the exhaust alone may be considerable, and an improvement may be made very simply. It has even been proposed to use the exhaust, suitably directed, for laying the dust which is otherwise raised by the car; and M. Baudry de Saunier, editor of *La Vie Automobile*, vouches for the efficiency of the Feugère system, as it is called. The exhaust is discharged from a horizontal pipe taken across the back of the car, having a line of holes along its length. Thus a number of jets in the same plane is formed, and the pipe is so mounted that the angle at which these jets impinge on the roadway may be varied so as to be as effective as possible. Naturally, the less fluctuating the stream of exhaust gases the better for such a purpose, and the result is said to have been much more satisfactory on a four-cylinder than on a single-cylinder car. I have not had an opportunity of seeing this device in action.

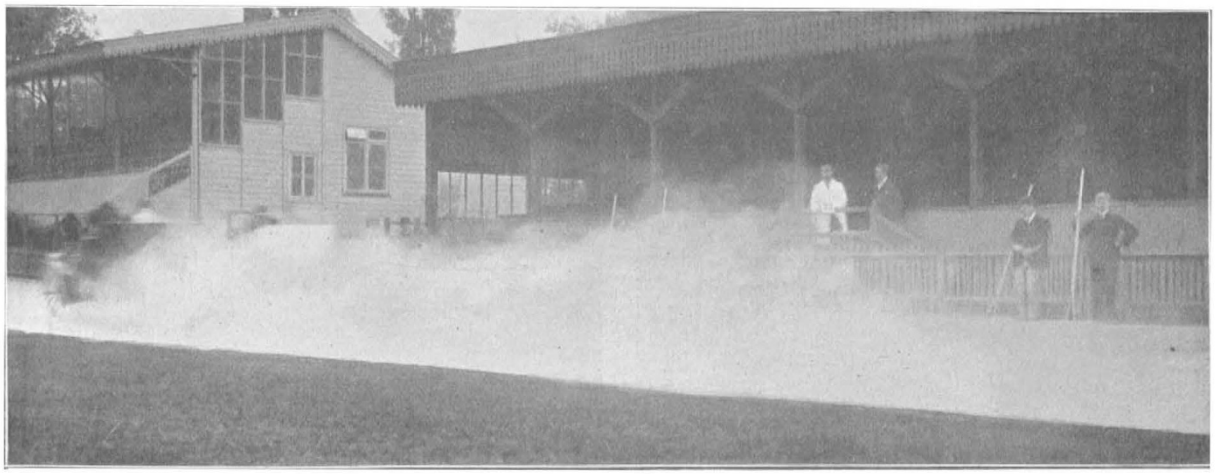

FIG. 2.—Test of a dusty car running over flour at the Crystal Palace. From the *Automobile Club Journal*.

Speaking generally, and leaving such special points as direction of exhaust out of account, it may be said that the dust is raised by the tyres, and is then scattered by the air currents produced by the body. In other words, if the body were moved along the road at its normal height, supported by other means than the wheels, very little dust would result. But it is equally true that if the wheels could be run without the body there would not be much cause for complaint as to dust. By *body* is here meant the whole structure, apart from the wheels, so that the term is more comprehensive than usual. The passage of a car body through the air necessarily creates a great deal of disturbance, and the extent to which the air near the ground is disturbed must depend to a great extent upon the shape of the body. The less the disturbance, the less will the dust be formed into a cloud.

In 1903, the Automobile Club tested the dust-raising qualities of a large number of cars. Each car was run at twenty miles per hour over a patch of flour on the cycle track at the Crystal Palace. The flour was kept at a definite thickness, and as each car passed it was photographed. These photographs gave a permanent record of the dust cloud raised by each car, enabling the committee to classify the cars in the order of merit. The records so obtained gave a great deal of useful information, and it was recognised that this method of testing was far more satisfactory than optical observations, because an observer has a good deal of difficulty in retaining a mental picture of what may be termed a standard car as regards dust.

In a paper read in 1903 before the Automobile Club, Colonel Crompton and Mr. Crawley came to the following conclusions, based on these experiments:—Hard tyres are better than soft; narrow tyres are better than broad; neither have a preponderating influence; flaring mud-guards are probably bad, especially if they come low down; cars which are low underneath are worse than cars a long way off the ground; but smoothness of bottom-shape and absence of forward coning are infinitely more important. There is strong evidence that it is desirable that the car should slope upwards towards the back. At the same time, the authors point out that "a low car is not necessarily a dusty one, nor is a high car necessarily dustless."

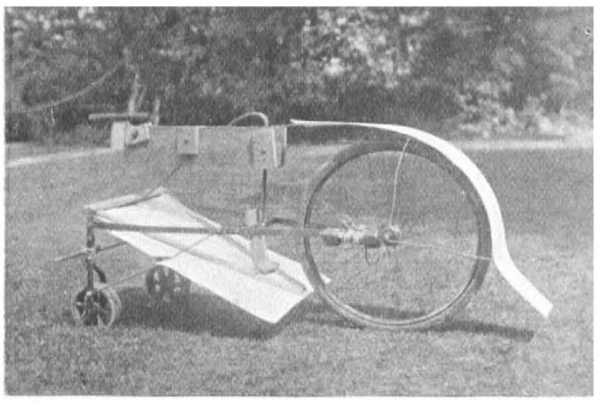

FIG. 3.—Experimental tricycle.

Figs. 1 and 2, which are reproductions of photographs taken during the Crystal Palace tests, show the great difference that already exists between different makes of car, the first being of a comparatively dustless car, and the second of a very dusty car, both running at twenty miles per hour, the pace being given by a "speed car" running alongside. It will be seen that it is possible to make cars comparatively dustless, though the means of doing so are not yet well understood.

In approaching the problem, it is necessary to give up all preconceived ideas, for the practical results by no means always agree with what would theoretically be expected. If a dusty car and a comparatively dustless car are examined and compared, it is often not at all easy to say why the one is more dusty than the other. People are apt to have the idea that comparatively small differences in the car body are important. Last year, however, the Automobile Club carried out a series of experiments on different shapes of body, and these showed that the dust raised did not depend to any great extent upon the shape, at least as regards small modifications of the upper structure. An irregular shape under the chassis is no doubt bad, and the transverse tool-box carried low down at the back of the car, which is frequently seen, is certainly harmful.

The investigation of the problem by means of a car is difficult, owing to the number of variables. For example, the experimental car may be a "medium" dust-raiser, and, if any modification is made, the effect may be masked to a considerable extent by other factors which we may not be able to control. Therefore it would be better, if possible, to study the problem with a much simpler apparatus, so that any one variable might be taken in turn without difficulty. In the hope of doing something in this way, I have recently carried out experiments on an elementary form of tricycle, which is shown in Fig. 3. This is drawn over a track laid with

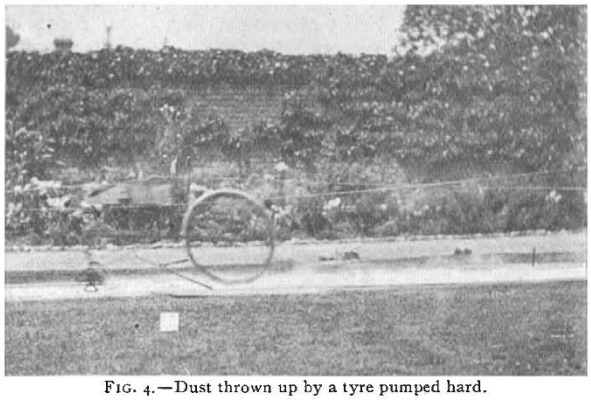

FIG. 4.—Dust thrown up by a tyre pumped hard.

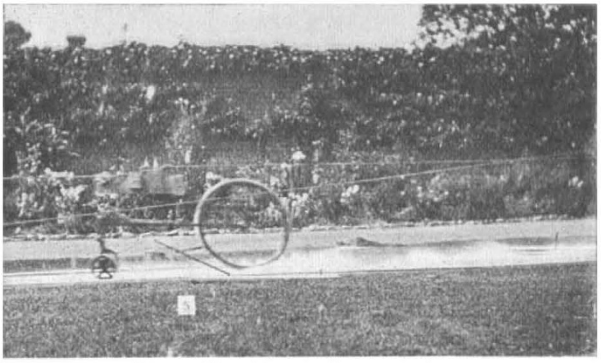

FIG. 5.—Dust thrown up by a very soft tyre.

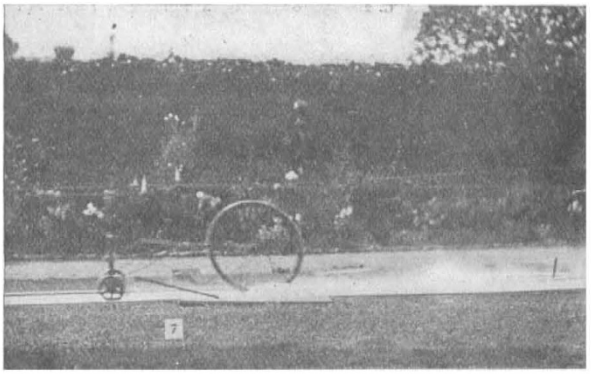

FIG. 6.—Dust thrown up by a very soft tyre loaded with 12 lbs.

flour at, say, fifteen to twenty miles per hour, and photographs are automatically taken to show how much dust is raised by the large wheel, which is an ordinary bicycle wheel. The flour is laid only along the centre of the track, so that the bicycle wheel is the only one that causes any disturbance. As the framework is of very simple construction, it may be regarded as causing no serious disturbance in the air, unless it is supplemented by some form of body. In the illustration it is shown provided with a mud-guard and an inclined plane; these, and any other "bodies," are easily made of cardboard, and a number of experiments can be carried out in a comparatively short time.

By stripping the frame, the action of the tyre alone, apart from any body, may be easily investigated in a way which is impossible with a car having four wheels with a conflicting set of mud-guards, or a body which will affect the back wheels quite differently from the front wheels. Thus Fig. 4 shows the dust thrown up by a tyre pumped hard, from

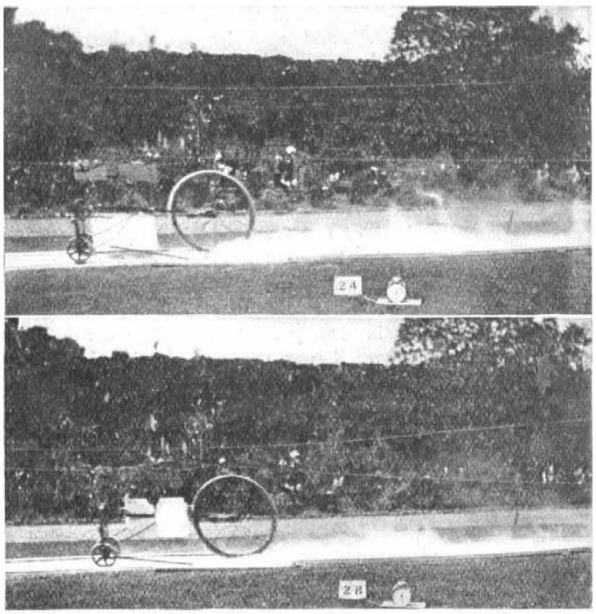

FIG. 7.—Dust cloud formed by a square box 3 inches off the ground.
FIG. 8.—Dust cloud formed by a square box 9 inches off the ground.

which it will be seen that the dust is only slight. In Fig. 5 the effect is shown of a very soft tyre, the dust being a good deal more. In both these photographs the tyre was unloaded, except for the proportion of the frame which it had to bear. But in Fig. 6 the effect is shown of a load of 12 lb. on the tyre, and it is seen that the dust raised is much increased.

Although, from the point of view of raising dust, the tyres may not be so important as the body, their action does seem to be important enough to warrant more careful investigation. They are capable, in themselves, of raising a good deal of dust, as is often to be seen in the case of bicycles. Very possibly dust is carried up by tyres through a kind of suction, and this may vary a good deal with the design. Now that there are so many different tyres, including non-skidding bands, on the market, there is likely to be a considerable difference in the various types as regards dust. In the photographs which are reproduced, the wheel is equivalent to the front wheels of a car, as there is no driving force on the tyre. In the case of wheels which are drivers, there will be a certain amount of slip of one kind or another, and the dust raised is likely to be greater; but, actually, there

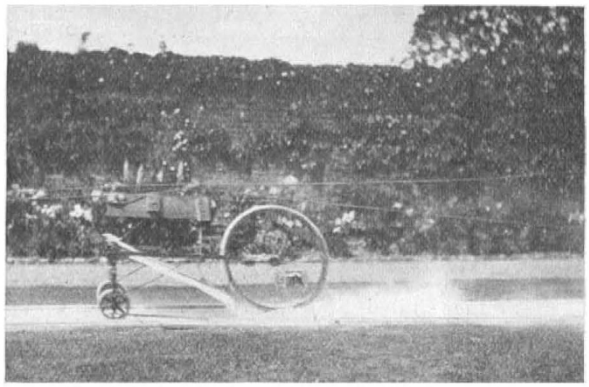

FIG. 9.—Effect of an inclined plane.

does not seem to be any very great difference between drivers and non-drivers—at least there is much less than would be expected.

As regards "bodies," Figs. 7 and 8 show the effect of allowing a square box, 18 inches long by 20 inches wide and 12 inches deep, to precede the wheel. In Fig. 7, which shows a large cloud of dust, the box is only 3 inches off the ground; but in Fig. 8 it is 9 inches above the ground. In the latter there is still a lot of disturbance, which fact is of interest, seeing that the bodies of certain cars are brought down to within about 6 inches of the ground. These illustrations and those following are comparable with Fig. 6, the tyre being loaded and soft, and the motion being always from right to left. In Fig. 9 is seen the effect of an inclined plane, so inclined that the air is severely thrown down on to the track. It is a little surprising to notice that the effect of the plane is not nearly so serious as that of the box seen in the two preceding illustrations, although the box and plane are about the same in width, and the plane, which is carried down to within about 4 inches of the ground, is of considerable length. It may be, therefore, that the inclination of the under surface of a car body is not of much importance after all. In Fig. 10 is shown the very marked disturbance caused by a vertical card, 12 inches square, fixed

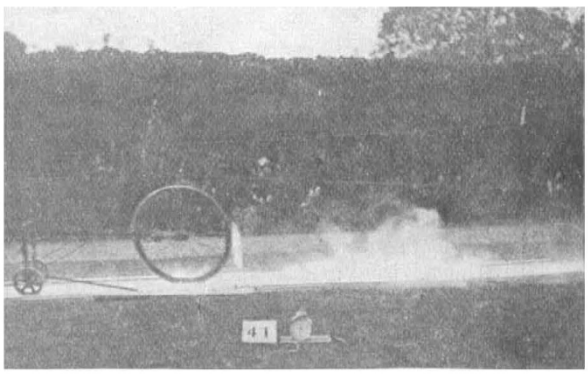

FIG. 10.—Effect of a vertical plane behind the wheel.

behind the wheel; this is akin to the tool-box which is often carried low down behind a car, and is generally recognised as having a bad effect.

In the present article it is impossible to go further into details. The apparatus as illustrated is rather crude and elementary, but I think enough has been said to justify the view that a good deal of useful work might be done by working with apparatus on these lines. W. R. COOPER.

THE INTERNATIONAL UNION FOR COOPERATION IN SOLAR RESEARCH.

A CONFERENCE of the International Union for Cooperation in Solar Research will be held on September 27 at New College, Oxford, by invitation of the warden and fellows of the college. The following delegates of societies constituting the union have signified their intention of being present:—

From the United States, Profs. Hale and Campbell; from France, Messrs. Janssen, Deslandres, Fabry, Perot, and the Comte de la Baume Pluvinel; from Russia, M. Belopolski; from Germany, Prof. H. Kayser; from Holland, Prof. H. H. Julius; from Sweden, Prof. Knut Ångström; from Switzerland, Prof. A. Wolfer; from Austria, as representative of the International Association of Academies, Prof. Edmund Weiss. Great Britain will be represented by Profs. Turner, Schuster, and Fowler, Father Cortie, Mr. W. E. Wilson, Major Hills, Dr. W. J. S. Lockyer, and Dr. Halm. The subjects of discussion will include the following:—

The fixing of standards of wave-length in spectroscopic research, cooperation in the measurement of the intensity of solar radiation, cooperation in recording solar phenomena by means of photographs of the disc, spectroheliograph records and observations at the limb of the sun.

The foreign savants will be lodged at and entertained by New College. On Friday, September 29, the president of the Astronomical Society and Mrs. Maw will give a reception at their residence in London, and for the following day invitations to visit the observatories at Cambridge have been received from Sir Robert Ball and Mr. Newall. Prof. Schuster is acting as chairman of the executive committee which was appointed last year at the first conference of the union held at St. Louis.

NOTES.

THE meeting of the International Meteorological Conference at Innsbruck was opened on Saturday last, September 9, and the full sittings began on Monday. The following is a list of members attending the conference:—F. Ackerblom, Upsala; Rev. P. J. Algué, S.J., Manila; A. Angot, Paris; R. Assmann, Lindenberg bei Breskow; A. Belar, Laibach; W. v. Bezold, Berlin; B. Brunhes, Puy de Dôme; V. Carlheim-Gyllensköld, Stockholm; V. Conrad, Vienna; P. M. Dechevrens, Jersey; E. Durand-Gréville, Mentone; Sir John Eliot, London; F. Erk, Munich; E. van Everdingen, de Bilt; G. Fineman, Stockholm; Rev. P. L. Froc, S.J., Zi-ka-wei; V. Gama, Tacubaya Obs., Mexico; G. Greim, Darmstadt; J. Hann, Vienna; G. Hellmann, Berlin; E. Hepites, Bukarest; H. Hergesell, Strassburg; H. H. Hildebrandsson, Upsala; W. Kesslitz, Pola; N. v. Konkoly, Budapest; W. Köppen, Hamburg; A. Lancaster, Uccle; W. Láska, Lemberg; E. Lauda, Vienna; J. Liznar, Vienna; Sir N. Lockyer, London; W. J. S. Lockyer, London; J. H. Lyons, Cairo; E. Mazelle, Triest; H. Mohn, Christiania; A. Mohorovičić, Agram; L. Moore, Washington; M. Nedelkovitch, Belgrade; L. Palazzo, Rome; A. Paulsen, Copenhagen; J. M. Pernter, Vienna; F. C. A. Pockels, Heidelberg; P. Polis, Aachen; G. B. Rizzo, Messina; A. L. Rotch, Boston; P. v. Rudzki, Cracow; M. Rykatchew, Petersburg; A. Schmidt, Potsdam; A. Schmidt, Stuttgart; P. Schreiber, Dresden; Ch. Schultheiss, Karlsruhe; Rev. P. Th. Schwarz, Kremsmünster; W. N. Shaw, London; A. Silvado, Rio de Janeiro; R. F. Stupart, Toronto; L. Teisserenc de Bort, Trappes; W. Trabert, Innsbruck; J. Valentin, Vienna; J. Violle, Paris. The members of the Solar Commission are:—M. Angot, Sir John Eliot, Prof. Hann, Sir N. Lockyer (president), Dr. Lockyer, Captain Lyons, Prof. Pernter, Prof. Rizzo, Dr. Rotch, Dr. Shaw, M. Teisserenc de Bort, Dr. Konkoly.

THE Carnegie Institution, Washington, sent Profs. F. Elster and H. Geitel and Herr F. Harms to Palma to make observations of the electric conditions of the atmosphere during the recent solar eclipse. By means of a self-registering electrometer, the variation of atmospheric electricity was photographically recorded, and a series of points of the same curve was taken simultaneously by eye-readings. The ionisation of the air was studied by a "Zerstreuungsapparat," and also by an "Ebert's Föncounter." Besides these observations, exact measurements of the intensity of the solar radiation within the short wave-lengths were carried out, a peculiar kind of photometer having been prepared for this purpose. It is based upon the property possessed by clean surfaces of the alkaline metals of emitting kathode rays of a density proportional to the intensity of the incident light; by these rays the small residue of gas contained in a vacuum glass bulb is rendered conductive, and a circuit of a current is closed, the intensity of which may be read by means of a d'Arsonval galvanometer. In the apparatus alluded to the sensitive surface consisted of a thin layer of pure rubidium metal. An accuracy of $\frac{1}{2}$ per cent. to 1 per cent. was easily obtained. By a blue Jena glass rays of long wave-length are absorbed before reaching the rubidium surface, so only the blue and violet, and partially the ultra-violet, region of the spectrum remains, and these are the radiations which may be supposed to have an ionising effect on the atmospheric air. The results, as well as the description of the apparatus, will be published in the reports of the Carnegie Institution. Unfortunately the observations, like all others in Spain, suffered from the bad weather conditions. On the day of the eclipse rain fell during the morning; consequently it cannot be considered as undisturbed with regard to atmospheric electricity. The measurements of the solar radiation were possible in a continuous series only from the first contact to the end of totality; the decrease of illumination, therefore, was determined in a satisfactory manner and without any gaps. On the other hand, clouds prevented any reading being taken during the increase of light after totality.

THE photographs of the total solar eclipse, taken by the Solar Physics Observatory Expedition at Palma, have proved to be better than was expected from the state of the sky during totality. A fine picture of the corona was secured with the long-focus mirror, but the clouds were too dense for successful tri-colour photographs to be obtained.

THE visit of the members of the British Association to the Victoria Falls on September 12 was made the occasion of the formal opening of the bridge over the falls, by Prof. G. H. Darwin, president of the association. In declaring the bridge open, Reuter's Agency reports Prof. Darwin to have remarked that the great enterprise of the Cape to Cairo Railway, of which the bridge is a part, had