

determined by the smaller instruments, and to some extent by the *astrolabe à prisme*, which has been confided to the care of Mme. Chandon. In the middle of the year 1918 a provisional observatory was installed at Lyons, to which the astrolabe and other instruments for determination of time were transferred. M. Henri Renan has retired from the service of the observatory after forty-four years' service, and M. Puisseux, who entered the observatory in 1879, resigned his office in the year 1917.

THE ATLANTIC FLIGHT.

THE safety of Mr. H. G. Hawker and Comdr. Mackenzie-Grieve, after their daring attempt at a direct flight across the Atlantic, is at present the feature of special interest. The *Times* of May 26, referring to the news, says "it will cause as keen and as widespread a joy as the news of many a victory in the war." Without doubt the safety of the two airmen has lifted a cloud which threatened to overshadow other competitors.

Much fog was encountered immediately after the start from Newfoundland, and, later, cloud and a squally northerly wind. The flight was made chiefly at an elevation of about 10,000 ft. A direct course for the British Isles was being made, and the aircraft had completed one-half of the journey eastward when, according to Mr. Hawker, "the machine stopped owing to the water-filter in the feed-pipe from the radiator to the water-pump being blocked up with refuse." It is said that there was no trouble in landing on the sea, and Mr. Hawker and Comdr. Grieve were picked up by the Danish tramp steamship *Mary* in lat. 50° 20' N. and long. 29° 30' W., after being in the water about one and a half hours, at 8.30 a.m. G.M.T. on May 19.

The *Mary* left New Orleans on April 28, bound for Denmark. Fortunately, this vessel was close at hand when the aircraft was in difficulty. An examination of the wireless weather reports published by the Meteorological Office in the International Section of the Daily Weather Report indicates that Atlantic liners were apparently nowhere near at the time.

From weather maps prepared, it seems that fair north and north-west winds were blowing from Newfoundland to about mid-Atlantic, with cloudy weather, the conditions being chiefly anticyclonic. Further eastward there was a cyclonic disturbance which occasioned gales and heavy weather. This storm system hovered in about the same position to the westward of Ireland for a fortnight, which, meteorologically, is very exceptional, its passage being barred by a region of high barometer which has persistently hung over Scandinavia. Such anomalies offer a decided difficulty to trans-Atlantic flying, although with more perfect engines and further improvement in the flying machines these difficulties will, without doubt, be overcome in time.

We join with the entire British public and others in hearty congratulations on the happy ending of the venturesome and courageous voyage.

The *Daily Mail* has generously decided to give a consolation prize of 500*l.* for division between Mr. Hawker and his navigator.

The United States Navy seaplane N.C.4, which accomplished a flight to the Azores from Newfoundland on May 16-17, left Ponta Delgada on May 27 and arrived at Lisbon on the same evening. This stage of the journey was about eight hundred miles, and the third stage to Plymouth, by which the trans-Atlantic flight is to be concluded as we go to press, is about nine hundred miles.

CARNEGIE LIBRARIES AND EDUCATIONAL WELFARE.

THE fifth annual report (1918) of the Carnegie United Kingdom Trust was submitted by the executive committee to the trustees on February 26, and has now been published (Edinburgh: T. and A. Constable). The work of the Trustees suggests that, as it is the fashion now to create new Ministries, there is a splendid opportunity for the Prime Minister to appoint a Minister of Philanthropy. Mr. Carnegie, with the most benevolent intentions, spent about two millions on libraries, and, while undoubtedly many towns owe him gratitude for his gifts of fine buildings, we fear the balance would show that he probably did more harm than good. Many of these libraries have proved to be mere white elephants, their upkeep in many cases practically exhausting the whole of the available income, resulting in miserably paid and ineffective staffs, and nothing left for the purchase of books. In some cases less than 1*l.* has been spent on books during an entire year. Whether or not Mr. Carnegie realised this before the end of his personal benefactions we cannot tell, but he very wisely handed over a large sum to carefully chosen trustees, who from the first have laid themselves out to amend past mistakes and make sure that fresh benefactions should be granted with some surety of lasting good results; they have, therefore, steadily refused to make building grants where the yield of the rate is inadequate for the maintenance of a proper library.

The trustees have taken education and the welfare of the people in the widest sense for their province, and they have made the renewal of their annual grants dependent on results. The report is well worth reading. Taking as their model the excellent Yorkshire Village Library scheme, which for more than fifty years has done so much for the working classes, the trustees have established and maintained rural circulating libraries throughout the country, including both Scotland and Ireland, some under the county education authorities, some in relation with town libraries, and others under the charge of the local clergy or schoolmasters. They have established and supported play centres for "toddlers"—that is, children below five years—and, for older children, cricket, football, and other games, all complete with pavilions and everything necessary. In fact, their motto for all such enterprises appears to be "thoroughness." Baths and wash-houses have not been forgotten, and one of their most recent experiments is the encouragement of music by offering rewards for compositions, which are published when judged worthy by their experts. Recognising that music takes a very high place among the instruments for elevating and refining the mind, they have requested Sir Henry Hadow to "investigate and describe the agencies which exist for promoting the practice and appreciation of the art of music among the people of the United Kingdom, and to report what steps might be taken towards their further encouragement in the future." Under the direction of Dr. Terry, considerable progress has been made with the recovery of the works of the musicians of the Tudor period and the transcription of them into modern notation.

The trustees have made a grant of 4000*l.* to the National Union of Women Workers for travelling welfare exhibitions in England and Scotland, the expenditure to be spread over two years; and a sum of 750*l.* for the same purpose has recently been paid to the Women's National Health Association for Ireland. Taught by their five years' experience, they direct special attention to that blot on our public

library system, the limitation of the rate, which prevents even the most powerful of our corporations spending whatever they think fit for the maintenance and development of their library systems. If there is to be any real reconstruction in the educational system of this country, this obstacle to progress should receive the immediate attention of the Government.

RECENT RESEARCHES ON CHOLERA.¹

THE subject I have chosen to speak about to-day is one regarding which probably but little is known outside the medical profession except that a great reduction in the death-rate has been brought about in recent years in perhaps the most justly dreaded disease of India, namely, cholera. I propose to give you a brief account of my prolonged researches extending over more than a decade, and dealing with several distinct problems by means of a variety of methods of research, physiological, physical, and chemical, as I think this work will best illustrate the value of various collateral sciences in medical research.

The treatment of cholera at the beginning of the twentieth century remained much as it was seventy years before, when Latta and Mackintosh in Edinburgh in 1831 introduced the plan of injecting large quantities of normal saline solution into the veins to combat the collapse stage of cholera. This brilliant idea just failed to be a great discovery because no means were then found of retaining the fluid in the circulation, so that the apparently miraculous immediate effect of reviving the patient as one from the dead was usually followed by fatal recurrence of the terrible drain of fluid from the system. At the time I commenced my investigations the method was seldom used, as shown by the fact that a search through the records of the Calcutta European General Hospital from 1895 to 1904 showed no case in which large saline intravenous injections were given, while the mortality among ninety-five cases in those nine years reached the appalling figure of 87.4 per cent. Indeed, it was generally recognised that once a European patient reached the collapse stage in cholera recovery scarcely ever took place.

Recent Researches on the Treatment of Cholera.

As the first whole-time professor of pathology in Bengal, the home of cholera, who stuck to un lucrative research work for any length of time, this fell disease naturally attracted my attention, but it was not until after the completion of the first edition of my work on fevers in the tropics, the collection of material for which occupied me for twelve years, that I was able to take up serious work on cholera in 1908. I had previously made a number of blood-counts, and, with the help of my friend Major Megaw, had studied in 1906 Latta and Mackintosh's plan of injecting large amounts of normal or isotonic salt solutions—that is, one containing the same proportion of salts as the normal blood, controlling the quantities injected by special blood, and blood-pressure examinations—in the hope that, with the aid of these modern methods, better results would be obtained. This hope was largely disappointed, as the mortality only fell from 59 per cent. during the previous eleven years to 51.9 per cent. in 1906, and the method, which is a time-consuming one, was once more abandoned as of little service.

On thinking the matter over while on furlough, it occurred to me that on the physiological principle that a high salt content tended to retain fluid in the

blood, it would be worth while to try a stronger salt solution, and on return from leave with renewed energy at the end of 1907 I determined to put this theory to the test. Up to that time the strength of salines generally advised in cholera was 0.6 per cent., although recent physiological text-books have raised the figure for normal saline to 0.85 per cent. As I wished to give a hypertonic solution—that is, one containing more salt than the normal blood—I doubled the former strength and used a 1.2 per cent. of sodium chloride, or 120 grains to a pint, to which I afterwards added 4 grains of calcium chloride, because physiologists have found the latter salt to be beneficial to the heart. Capt. (now Lt.-Col.) Mackelvie very kindly carried out the hypertonic injections on the cases under his care, while I made a series of observations on the blood, to be related presently. The results may be summarised in a sentence by saying that by using two teaspoonfuls of common salt to a pint of water instead of one, the mortality from cholera was nearly halved. Nothing could well be simpler, yet nearly eighty years had elapsed since salines were first injected intravenously in cholera before the physiological principle of using a hypertonic instead of an isotonic solution was established. It was at once clear to me that a great advance had been made, which stimulated me to persevere with my investigations of the blood-changes in cholera, so as to place the whole subject on a firm scientific basis.

The Blood-changes in Cholera as a Basis for the Hypertonic Treatment.

In the first place, I estimated the amount of chlorides in the blood before and after saline injections in a series of cases, and found that in the most severe cases they might even be below the normal point in spite of the great concentration of the blood, thus establishing a vicious circle and leading to further rapid loss of any isotonic solution injected into the veins. I further established that the hypertonic saline did materially raise the salt content of the blood, and to the greatest extent in recovering cases, which explained both the failure of the former isotonic and the success of the hypertonic solutions.

Another important point was to estimate the amount of fluid lost from the blood in cholera, so as to ascertain if the amount was in proportion to the severity of the case, and to learn how much salt solution it is necessary to inject to replace the loss. For this purpose I centrifuged a few drops of defibrinated blood obtained by pricking the finger-tip in a graduated capillary tube, and measured the volume of the solid corpuscles and of the fluid serum. By comparing the figures obtained with those of normal blood the percentage of fluid lost from the blood could be estimated. For example, in a severe case only 18 per cent. out of the original 55 per cent. of serum remained, showing a loss of no less than 67 per cent. of the fluid portion of the blood as a result of the copious evacuations. A series of such observations indicated that in mild cases of cholera not showing any serious collapse an average of 35 per cent. of the serum was lost; in collapse cases recovering after the hypertonic saline injections the loss averaged 52 per cent.; while in extremely severe cases, who were lost in spite of the new treatment, the figure averaged no less than 64 per cent., or almost two-thirds of the fluid of the blood. I have seen cases of cholera in which the blood was so thick that on opening a vein a drop of black blood slowly exuded having the consistency almost of tar—a condition which must rapidly terminate fatally if not quickly relieved. By repeating these estimations immediately after several pints of saline had been run rapidly into a vein in collapsed cholera cases, I was able to ascertain the quantities required to restore the

¹ From the presidential address delivered to the Indian Science Congress, Bombay, 1919, by Lt.-Col. Sir Leonard Rogers, F.R.S.