Important factors mentioned are the texture of the soils, their retentiveness of water, *p*H values and water-soluble contents. The *p*H values of the soils chosen ranged from 2·6 in Rifle peat to 9·4 in Merced silt loam, thus covering the ambit of soils in general.

The reasons why pipes in some soils corrode more rapidly than in others have not as yet been fully determined. Soil solutions are often too weak to account directly for the observed corrosion, but the electric conductivity of soils containing soluble salts is important. Soil bacteria may also play a part. Differences of potential between various points on the surface of the material are a fruitful source of trouble; these may be due to many causes, including the presence of scale, segregations and variations in the soil itself in contact with the material in different places.

Eight cast irons were tested, including one high-alloy cast iron with 2·61 per cent chromium and 15·0 per cent nickel. The results of exposures for two, five, seven and nine years are compared, and the superiority of the high-alloy metal demonstrated both as regards loss in weight and depth of pitting. The plain and low-alloy cast irons (*c.* 0·5 per cent copper) with silicon ranging from 0·95 to 2·50 per cent behaved very much alike.

An interesting experiment consisted in embedding two different plain cast irons in contact in very wet Docas clay, the water-soluble material of which was almost entirely sodium chloride. At first one of the cast irons was cathodic to the other; but after considerable drying of the soil a reversal took place, the cathodic metal now becoming anodic. This illustrates the importance of such factors as soil aeration and water-retentiveness, as also the difficulty of forecasting results in practice in view of seasonal variations in rainfall and drought.

For many years attempts have been made to increase the resistance of steel to corrosion by alloying with different elements such as chromium, nickel and copper. In the present research, cleaned 5 per cent chromium steel, after various periods of exposure up to nine years in ten different soils, lost less in weight than ordinary steel but was more deeply pitted. Many investigators have already directed attention to this behaviour of chromium steels under quite other conditions of corrosion. The authors attribute it to formation of a protective superficial oxide film which breaks down locally, setting up potential differences leading to localized corrosion. This is a generally accepted view. On the other hand, cleaned nickel-copper steel (2·47 per cent nickel, 1·08 per cent copper) proved superior to ordinary steel both as judged by loss in weight and depth of pitting, whereas the same steels exposed with adherent scale showed no advantage after four years.

Turning now to the non-ferrous metals, a useful table is given summarizing the losses in weight sustained by nine copper alloys relatively to that of tough pitch copper taken as 100. This latter metal was very resistant to corrosion, as was also red brass (14·8 per cent zinc) and copper-nickel alloy (5 per cent zinc, 20·0 per cent nickel). The zinc content of the brasses included in this set ranged from 14·8 to 39·6 per cent (Muntz metal), and the apparent losses in weight rose steadily with the zinc content. It is pointed out, however, that in some cases the observed losses do not accurately indicate the extent of corrosion, since part of the zinc had been removed by selective corrosion which weakened the material. The observed depth of pitting also might be misleading as in some soils dezincification occurred, the depth of which was not known. The addition of 0·08 per cent arsenic to Muntz metal did not prevent dezincification, but the authors suggest that more arsenic might yield better results.

It was noted that, in general, soils that are severely corrosive to iron may be non-corrosive to lead, the exceptions being highly organic soils. This is attributed in part to the formation on the metal surface of insoluble salts, such as sulphate, chloride or carbonate, which protect the underlying metal from attack. Organic salts, on the other hand, are usually soluble. The addition of 5 per cent antimony did not materially improve the resistance of the lead.

Copper tubes coated with a thin layer of tin appeared to receive a temporary protection, but in the course of four years much of the tin disappeared. Reversal of potential is suggested as a cause of failure, the tin being anodic and protecting the copper just as zinc protects galvanized iron. But reversal might be caused by the presence of tin-copper alloys which are cathodic.

Experiments with lead-coated steel pipes were not encouraging; the authors doubt if a lead coat of any reasonable thickness can be satisfactory in corrosive soils. On the other hand, zinc applied by the hot-dip method to the extent of some 3 oz. per sq. ft. increased resistance to corrosion; it is concluded, however, that it would not add more than four years to the life of the pipe.

Vitreous enamel, rubber coatings, a thick moulded coating of China wood oil with mica, and a baked-on 'Bakelite' coating were each found to reduce corrosion substantially over periods of from four to nine years.

It is impossible in a brief article to do full justice to the mass of data contained in the report. The foregoing is an attempt to lay before the reader the salient features of the research.

J. NEWTON FRIEND.

OBITUARY

President Roosevelt

NOT since Abraham Lincoln was assassinated at the moment of victory eighty years ago has the death of an American president shocked the world like the passing of Franklin Delano Roosevelt on April 12, at the age of sixty-three.

Over the success and achievements of the New Deal policy which Mr. Roosevelt initiated when he entered on his first term of office as president in 1933 there is still much controversy. The policy had its faults; but, comprising economies in the public service, plans for unemployment relief, public works enterprise on a large scale, and schemes for the rehabilitation of agriculture, with the accompanying National Industrial Recovery Act, which authorized the President to frame a code of regulations for each industry, and the further legislation passed during 1934 and the first part of 1935 dealing with currency, tariff, public utilities and taxation questions, and the Social Security Act in which, for the first time, the United States accepted the principle of national unemployment insurance and old-age pensions, it nevertheless was a landmark in American history.

The full extent of Mr. Roosevelt's contribution in the New Deal policy cannot perhaps be accurately assessed as yet, though the bitterness of the personal attacks on the President made by its opponents and the determination with which he himself supported

it in the face of the judgment of the Supreme Court in May 1935 invalidating the Industrial Recovery Act and later decisions which similarly declared un constitutional several minor but important features of the New Deal indicate that the policy owed much to the impress of his forward-looking mind. Already in the achievements of the Tennessee Valley Authority that outlook has been vindicated, and the possibility of a new and more positive conception of government demonstrated to the world. That experiment was not only a social venture but also, in a true sense, a scientific approach to the problem of the conservation and development of national resources, and the integration of local and regional administration with central government. It is an approach of exactly the same order as that which characterizes the report of the Committee on Administrative Management with which Mr. Roosevelt's name is also associated. That great State paper and the Tennessee Valley Authority are sufficient evidence of Mr. Roosevelt's appreciation of the importance of a scientific approach to the problems of government and planning, and when the dust of controversy settles down it may well be found that scientific workers have a special reason to hold Mr. Roosevelt's name in remembrance for the way in which his determination and vision made possible a more effective contribution of science to the service of mankind, while at the same time his sense of human values never allowed that contribution to be overstressed.

While his well-known physical disability may well have increased Roosevelt's sympathy for and understanding of the less privileged people of his country, his forward-looking mind led him to seek further ways of overcoming it. In his 'fireside talks' he utilized the new technique of broadcasting with skill and success and was able not only to overcome the obstruction of Congress to measures which he regarded as essential and urgent but also to win a place in the mind of the ordinary citizen of all lands as the moral champion of freedom and human rights against tyranny and aggression. He was one of the earliest, even amid his preoccupation with the New Deal, to sense and give expression to the seriousness of that challenge to liberty, and the skill with which he used his broadcasting technique and endeavoured to express rather than lead public opinion during the first few months of the War was an important factor in securing endorsement of such successive acts in support of Great Britain and the cause for which the United Nations now stand as the setting up of a permanent joint board to consider plans for the defence of the United States and Canada, the transfer of over-age American destroyers to the Royal Navy and the lease of naval and air bases in British North America to the United States, and his great personal triumph in re-election for a third time in November 1940.

In the following year down to the Japanese attack on Pearl Harbour, Mr. Roosevelt's genius for timing was even more strikingly manifested, and the British people, and indeed the United Nations, can never forget the consummate skill with which he handled such matters as Lend-Lease, the establishment of air bases in Greenland, the dispatch of American forces to Iceland, and the amendment of the Neutrality Act. Much, no doubt, was due to the skill with which the President in his broadcast addresses and speeches voiced the aspirations of the common man and showed the way in which his policy tended to satisfy them. Even before the Atlantic Charter was drafted, Mr. Roosevelt had showed a gift for the right and effective phrase which put some of his speeches, like those on the four freedoms and on the arsenal of democracy, alongside the Gettysburg speech of Lincoln in the literature of democracy.

On Roosevelt as a war leader the time for judgment has not yet come. Imagination has seized on the way in which this crippled leader has flown across the world to attend one conference after another. Within these years, moreover, he saw the establishment not merely of such joint agencies as the Anglo-American Combined Raw Materials Board and the corresponding Food Board, the Middle East Supply Centre, the Anglo-American Caribbean Commission, the post-war implications of which the President was one of the first to see, but also the inauguration of such definite organizations to deal with post-war problems as U.N.R.R.A. and the Food and Agricultural Organization.

It was these perhaps and the tentative scheme worked out at Dumbarton Oaks, considered further at Yalta, and now to be discussed at the San Francisco Conference that lay nearest his heart. While he did not live to see the moment of complete victory, he lived long enough to see it close at hand and to know that so far as such victory, complete, comparatively cheap, and dramatic could justify his choice of commanders, his judgment and courage have been fully vindicated. But if Mr. Roosevelt was an organizer of victory it is as one of the great architects of human liberty that he will be best remembered. We cannot measure yet what his passing may mean in inspiration and authority just as the foundations of the new world order he has done so much to plan are to be laid. Among the makers of America he will rank with Washington, Jefferson, Jackson, Lincoln and Wilson. But more almost than any of his predecessors he had the confidence of the common man, and the common man, looking back, while endorsing the verdict of the man of science that he gave science a wider opportunity to serve mankind, may well come to regard him above all as the architect of a world order in which the four freedoms are at last enshrined. Roosevelt himself would ask no more of his countrymen or of the United Nations than that they should continue to accomplish thoroughly this task to which he—and they—have set their hands. Gratitude to Britain's friend in her finest and darkest hour demands no less. "We have learnt," said Mr. Roosevelt in his Fourth Inaugural, "that we cannot live alone, at peace; that our own well-being is dependent on the well-being of other nations—far away. . . . We have learnt to be citizens of the world, members of the human community." His infinite patience and tact and the inexorable march of events have committed the people of the United States overwhelmingly to joining some form of world organization. In a true sense he has given the world the tools and the opportunity to build again. There can be no more fitting tribute to his memory than to finish the job and to secure that the structure is adequate to the purpose to which it is dedicated.

But no tribute to President Roosevelt would be complete without reference to the help he received throughout his career from his wife, whom he married in 1905, Anna Eleanor Roosevelt, a niece of Theodore Roosevelt. To her and her four sons and daughter will be extended the heartfelt sympathy of the British people, many of whom have reason to know how nobly Mrs. Roosevelt seconded the President's efforts to aid them when they stood almost alone.