able to take a variety of photographs of a patient from head only to full-length. He had found that a 4¾-in. lens was adequate for full-length and an 8-in. for head and shoulders. A 14-in. lens gives a close-up of an individual part with the patient lying flat about 5 ft. below the camera.

As a matter of interest, Mr. Andrews showed a photograph of a patient with one brown eye and one blue, taken with orthochromatic film without a filter. Only one photoflood lamp was used, and the colour rendering was excellent.

Mr. K. Hennell (Metal Box Co.) said that he had taken several thousand clinical photographs during the War in colour, and used Sashalite bulbs exclusively for illumination. He considered this was the best method for tackling a variety of jobs and agreed with Mr. Kilner concerning the necessity for standardization. He exhibited several samples of colour prints on paper.

It was in the discussion generally agreed that clinical photography should be undertaken by a professional photographer who would find it advantageous to make a special study of physiology and anatomy. It was not considered reasonable to expect a medical man or surgeon to do his own routine photography, and it was also pointed out that the majority of hospitals, while equipped for X-ray work, are not well equipped for clinical photography.

Those interested in the formation of a Clinical Photography Section should write to the secretary of the Association, Mr. R. M. Weston, at Houndwood, Farley, Nr. Salisbury, Wilts.

REHABILITATION OF THE 'SCORCHED EARTH' IN THE U.S.S.R.

THE preliminary arrangements have recently been announced by the Soviet Government for the rehabilitation of the different regions of the U.S.S.R. as they are liberated from the Germans. A Commission has been set up representing forestry, timber supply and other interests to arrange for the erection of buildings on the collective farms and of dwellings for the workers. Use is to be made of local supplies of brick or artificial stone of various kinds, and of houses prefabricated in factories: the standard is to be a flat for four families, and thirteen factories are to be put into operation with a capacity of eighty flats per month. The Agricultural Bank will allow 10,000 roubles credit to each family for a period of seven years.

Railways also are to be restored, and dwellings for the staff and the various establishment shops and buildings are to be erected.

Such live-stock as were driven eastwards are to be restored, and regulations have been drawn up for the movement of specified numbers of the animals from seventeen of the reception areas to collective farms in specified regions including Orel, Smolensk, Voronezh, Stalingrad, Rostov, and Stavropol: impressive totals are involved, including 206,000 cattle, 342,000 sheep and goats and 53,000 horses, though these represent only a fraction of the peace-time numbers of animals in these regions. Collection of the animals at specified points in the reception areas was to be completed by September 1, and they were to reach their destination between October 1 and 15. The difficulties will be considerable, but the routes have been worked out: the journey for the animals is in some cases 800 miles. Arrangements have been made for feeding and watering the animals during their journey and for checking the numbers and duly accounting for their arrival. The risk of carrying disease will be very great, but fifty veterinary surgeons (1 for each 12,000 animals) and a hundred assistants are to be seconded from the reserve of the Red Army and distributed along the routes. In order to ensure further attention when the animals reach their destination, schools are to be set up in each liberated province giving veterinary courses varying in duration from three to twelve months. The Agricultural Publishing House is to be given 50 tons of paper for the printing of instructional literature. Other decrees deal with the provision, payment and transport of the drovers.

Collective farms are being recommended to keep all male calves of 1942 and 1943 to become working oxen.

In the case of poultry, it was necessary to establish incubator and poultry-breeding stations sufficient to deal with 16 million eggs: the aircraft industry was instructed to supply the thermostats and thermometers. The number of specialists required will be considerable: 130 are to be detailed for the new stations, but this number will not suffice, and it is proposed to start courses for training a further 580. In order to ease the work of the collective farms as they are re-established, considerable exemptions during the first year are permitted from the deliveries required to be made by the farm to the State; these apply to farms that have suffered from enemy occupation and households that have suffered bereavement or in which the able-bodied members belong to a specified group of experts. Tractor maintenance and repair stations are to be set up, and schedules are issued of spare parts, etc., that must be stocked.

Special provision is made for supplying railway workers with allotments of about one-third acre on which they may grow what crops they like. These plots are to be exempt from compulsory deliveries to the State: they are to be supplied with seeds, pigs and chickens. Provision is also to be made for the education of orphans and children of Red Army men and partisans; there are to be nine 'Suvorov' military schools, somewhat like the old cadet schools, each for about five hundred boys; and twelve 'industrial' schools for boys from the age of ten and for girls from the age of eleven. Co-education is not adopted in these new schools. Houses for 16,300 children are to be set up.

LIGHTNING PROTECTION OF BURIED CABLE

FOR the new toll facilities now being installed in the United States, much of the cable is laid underground to secure greater immunity from effects of sleet, snow, and storms. Burying the cable alone is not necessarily sufficient to free it from the effects of lightning damage. Moreover, when lightning damage such as fusing of cable pairs or holes in the sheath does occur, it is not so easy to locate and repair as on aerial cables since excavations may have to be made at a number of points. As a result of this situation, studies have been made of the factors affecting damage of buried cables by lightning, and

the remedial measures which have been devised to provide substantial protection in most cases that are encountered are described in an article by E. D. Sunde (*Bell Lab. Rec.*, **21**, No. 9; May 1943).

When lightning strikes, the current spreads in all directions from the point where it enters the earth, and if a cable is in the vicinity it will provide a low-resistance path so that much of the current will flow to the cable and in both directions along its sheath to remote points. The flow of current in the earth between the lightning channel and the cable may give rise to such a large voltage drop that the breakdown voltage of the soil is exceeded, particularly when the earth resistivity is high. The lightning stroke will then arc directly to the cable from the point where it enters the earth, often at the base of a tree. When this happens practically all the current reaches the cable sheath. Furrows so long as 100 ft. have been found in the earth along the path of such arcs.

The current entering the sheath near the stroke point is attenuated as it flows toward remote points. The current leaving the sheath must flow through the adjacent soil, and the amount of this leakage current per unit length of cable is therefore smaller if the soil resistivity is high than if it is low; thus the current will travel farther the larger the earth resistivity. The flow of current along the sheath produces a voltage between the sheath and the core conductors, which is largest at the stroke point. This voltage is substantially equal to the resistance drop in the sheath between the stroke point and a point which is sufficiently remote so that the sheath current is negligible. Since the higher the earth resistivity, the farther will the current travel, this resistance drop will also increase with the earth resistivity. The maximum voltage between sheath and core is thus proportional to the sheath resistance and also to the square root of the earth resistivity. Carrier cables now being used are of smaller size and have a higher sheath resistance than full-size voice-frequency cables, and for this reason they are more subject to lightning damage, particularly when the earth resistivity is high.

Tests were made on the Stevens Point-Minneapolis cable, using a surge generator which generates a short-time surge of current similar to that of a lightning discharge but of much smaller magnitude. An earth was established remote from the cable, and the surge generator was connected between this earth and the cable sheath, and between the remote earth and earths at distances of 10, 25, and 100 ft. from the cable. Results of the tests are given in the article.

When the voltage at the point where current enters the sheath is great enough to break down the insulation, the conductors and sheath are brought to essentially the same potential by the arcing. Under these conditions, the voltage between conductors and sheath increases with distance along the cable. A maximum is reached at some distance from the original fault, and beyond this point the voltage slowly decreases. After a puncture of the insulation where the current enters the sheath, other failures may therefore occur at some distance from this point in either or both directions. A single lightning stroke may thus cause insulation failures over a considerable distance along the cable.

One method of reducing failures caused by lightning strokes to buried cables is to increase the core insulation. This has been done for most new installations of buried cable. The cable itself, and such accessories as cable terminals and stubs, loading pots, and gas-alarm contactors are all provided with sufficient extra insulation to double the dielectric strength between cable conductors and sheath. For a cable like the one on which measurements were made, such increased insulation would reduce the number of lightning strokes that could cause failure by direct arcing to the sheath to about 15 per cent of the total instead of 50 per cent, and would almost entirely eliminate the danger of breakdown when lightning strikes the earth as much as one hundred feet from the cable. Another method, which may be employed in addition to the extra insulation where excessive lightning damage would otherwise be expected, is to bury shield wires over the cable. These conduct away part of the lightning current and thus reduce the amount that flows along the sheath. These wires may be ploughed in with the cable, or they may be installed afterward. The percentage of the current carried by the wires depends to a greater extent on their inductance relative to that of the sheath than on their resistance. Two wires are employed in order to obtain a lower inductance than would be possible with a single wire.

On the route between Stevens Point and Minneapolis where the shield wires were installed after the cable was in place, two 165-mil copper wires about 12 in. apart were ploughed in some 10 in. above the cable for a distance of 80 miles. Surge measurements made after these wires were installed indicated that the wires reduced the voltage between sheath and core conductors by about 60 per cent, which is in substantial agreement with theoretical expectations. The shield wires should thus reduce the number of direct lightning strokes that would be expected to cause failure to about 10 per cent, instead of 50 per cent without shield wires.

PLANT DISEASES

SEVERAL papers concerning plant diseases appear in a recent number of the *Transactions of the British Mycological Society* (**26**, Pts. 1 and 2; April 1943). Measurement of the intensity of plant disease in the field has occupied the attention of a sub-committee of the Society's plant pathology committee. The results indicate some rather suggestive lines of attack in the investigation of several diseases. A graph showing the incidence of potato blight at the Seale Hayne Agricultural College for different years, and for other localities for 1941, is very illuminating. The quick rise to a high degree of infection in 1932 is in marked contrast to the slow development of the disease in 1937, and merits further investigation. Other results are quite as suggestive. The sub-committee's main contribution, however, is in the standardization of methods, details of which are given in the paper.

W. C. Moore continues his series of descriptions of new and interesting plant pathogens. A disease of maize seedlings raised in nutrient solution was found to be caused by *Fusarium moniliforme*. It could be eliminated from the grain by soaking and heating to 54° C. for 20 min. A species of Penicillium, probably *P. hirsutum*, has also been assigned as the cause of a rot of Scilla bulbs, and *Helminthosporium Allii* is the pathogen of a bulb canker of garlic. This disease was discovered in an imported consignment before it could be planted, and so should not establish itself here. A brief note by H. Duerden announces