the heat of the oil (usually about 130° F.) combined with the pressure of the earth on the pipe after it has been buried will be sufficient to soften whatever asphaltum there is in the paper and form the necessary bond between paper and pipe to keep the water out. Without question, this supposition is correct to a certain extent. The paper, especially where a heavy quality is used, will undoubtedly adhere to the pipe in most places where it comes in contact with the metal; but it is to be noted that roofing papers applied to a pipe, while still on skids above the ditch, and allowed to stand in the sun for a few hours, will stretch to such an extent that the contact will be found to be on the upper circumference only, there being often as much as one-quarter of an inch of space between the bottom of the pipe and the paper. It is a serious question if this same thing does not occur when the heat from the oil first reaches the paper, even though the pipe has been lowered into the ditch and covered up. The paper, of course, does not bag uniformly as in the case above ground, but the surplus is taken up in wrinkles, and these wrinkles are very apt to be connected for the entire length of a joint of pipe. Should any injury occur to one of these wrinkles, or a crack develop in it, which will undoubtedly be the case as oxidation goes on, it is not at all improbable that water, which would enter, would reach every place in a joint of pipe where the paper was not securely stuck on, and thus render the whole covering practically useless. Where asphaltum is used as a binder, the wrinkles that form will be filled, thus preventing the water from entering, even though the paper should in time crack at these points. Time alone, however, can solve this much-mooted question, since there are no lines in California protected in this manner that have been laid a sufficient length of time for these cracks to develop.

For covering the collars, the same method is used as with the spiral wrap, except that the binder is often omitted. This it would seem, is even more serious than omitting the binder from the main body of the pipe, since it gives the water a chance to get between the paper and pipe through the ends of the wrinkles.

Whether a binder is used or not, the lap should always be made on the top of the pipe with the outer portion of the lap looking down, and wires should be placed about every sixteen inches. This is necessary to prevent the paper from being pulled away from the pipe by its own weight before it can be lowered into the ditch and covered.

RATS AND PLAGUE.

The bacteriological examination of 100 rats, at the public health laboratory, of Manchester, England, which was commenced during the previous year, was completed in June last. No bacilli suggesting plague were discovered in any of the bodies, but in six cases parasitic cysts of the liver were found; in only one case were bacilli of a possibly pathogenic nature seen, but of course not plague producing; in nineteen cases putrefactive bacilli or cocci were discovered; in twenty-three trypanosomes were found in the blood. The last mentioned feature, although having no special indication so far as is known at the present time, is somewhat interesting. Trypanosomes are a species of protozoa or low form of unicellular animal parasite of a flagellate or whip-like shape which infest the blood of man and animals, and which are responsible for various diseases in reptiles, mammals, fishes, etc. One variety (trypanosomes gambiensis) produces sleeping sickness, and is introduced into the blood of human beings by means of a fly. Knowing the way these parasites are carried from one body to another, it is certainly interesting, if nothing else, to find so many of the rats thus infected.

NEW METHOD OF PURIFYING WATER.

What is understood to be a new method for the speedier purification of Thames water has been discovered by Dr. A. C. Houston, of the Metropolitan Water Board. He adds lime to raw water in such quantity as to kill all the germs. He states that when 1 part of quicklime (about 75 per cent. CaO) is added to 5,000 parts of raw Thames water, about .007 per cent. free CaO is left in the mixture, and this excess is sufficient to kill B. coli in from five to twenty-four hours. The result of this process is to make the water unusable on account of the quantity of lime in it, and Dr. Houston proposes to correct this by mixing it with natural water which has been purified by storage. It would require about one part natural water for three parts quicklime water to produce a potable mixture. Thus it would be sufficient to purify only a third of the water needed for London by storage. The rest could be dealt with by lime and then mixed. The principle is thus described by Dr. Houston:—

Fifteen lbs. of quicklime, costing three-halfpence, would be added to 7,500 gallons of raw unstored Thames water. This would kill within twenty-four hours the B. coli, and inferentially, but certainly, the microbes also of epidemic waterborne disease (e.g., the typhoid bacillus). The water would also be improved considerably, as judged by physical and chemical standards. The excess of lime (about .007 per cent.) would then have to be neutralized with 2,500 gallons of adequately stored water, which, according to all my experiments, would not contain any of the microbes of epidemic waterborne disease. Thus 75 per cent. of the water would be sterilized chemically, and the remaining 25 per cent. by nature's own method of sterilization (storage). The mixture would have lost about 75 per cent. of its total hardness, and would contain no undesirable excess of free lime, besides being perfectly innocuous. Rapid filtration alone would then be required to remove the precipitate of inert carbonate of lime, and to bring the water up to a reasonable standard of chemical purity.

The system would be more expensive—in fact, doubly so—than sand filtration, but it would have certain distinct advantages, notably, its adaptability, its special suitability for flood waters, the saving in soap, the capacity to render quickly an initially foul water absolutely safe, the postponement of the construction of new storage reservoirs, and the raising of the purity of the metropolitan water supply to a pitch of perfection never before attained.

TUNNEL UNDER COLORADO RIVER.

The task of boring a tunnel under the Colorado River has been accomplished. Reports received by the United States Reclamation Service announce that the top drift of the Yuma tunnel penetrated the California bank on May 3rd, making connection with the shaft on that side, and completing the crossing of the stream. This tunnel, or siphon, is one of the most dangerous and difficult engineering structures undertaken by the Reclamation Service. It is one of the features of the Yuma irrigation project, which will reclaim 100,000 acres of the arid lands in the delta of the Colorado, known as the American Nile. It will carry water from the main canal on the California side to the Arizona canal system.

The great siphon will be 1,000 feet long, with an internal diameter of fifteen feet. It crosses the turbulent Colorado River 100 feet below the surface of the stream, and penetrates for the entire distance a soft and pervious sandstone formation. Its construction required the use of compressed air methods similar to those employed on the Hudson River tubes.