The character of electrical equipment, considering the larger power required in main line service, is influenced by the problem of electric transmission to the locomotive and the collection of current from the conduction circuit. As the amount of current varies inversely as the voltage, the transmission and collection are therefore made easier at higher potentials. The development of equipment suitable for higher voltages has received much attention, and there are at present a number of important railway electrifications of this character on which alternating or direct current is used. The respective merits of alternating or direct current involve many details of which a very few are of general interest as influencing the trend of commercial development. As between the different systems the indications point strongly, however, toward the more general adoption of direct current for main line electrification and heavy railway service generally.

STANDARDS FOR THE TURBIDITY OF WATER.

In a paper read before the Illinois Waterworks Association by Francis D. West, chemist in charge of the Torresdale Laboratory, Philadelphia Bureau of Water, the author, in commenting upon the preparation of turbidity standards, regards the principle of correcting a standard determined by weight by the use of a field method as most unsatisfactory. No two laboratories nor any two persons in the same laboratory working independently in the preparation of silica standards, following the procedure outlined, will make standards exactly alike.

A field method is never accurate and the description of what is "An observation in the middle of the day, in the open air, but not in the sunlight, etc.," is a source of many possible interpretations. The amount of light, the size, shape and color of the vessel, the fineness of the material, to say nothing of the personal equation, all influence the results.

What is needed is a definite procedure by which standards can be duplicated from time to time by different chemists without variation.

Such a method has been in use in the laboratories of this bureau since 1901. It involves the use of diatomaceous earth, prepared as follows:

"Wash with water to remove soluble salts; dry and ignite to remove organic matter; treat and warm with dilute hydrochloric acid; wash until free from acid and dry thoroughly. Grind in agate mortar, sifting through 200 mesh sieve and dry in desiccator."

Take a weighed amount of finely ground material, about two grains, suspend in 500 c.c. of distilled water, shaking vigorously from time to time for two or three hours. Suspend for ten hours, decant supernatent liquid. Dry and weigh residue. The difference equals the amount in suspension. Dilute to standard and use as stock.

I have found that standards made in this way from different stocks do not differ perceptibly. All material that remains suspended for ten hours appears to be of the same degree of fineness.

We add a small amount of a saturated solution of mercuric chloride and make standards as follows: Use quart bottles of a high grade of white glass free from air bubbles. The standards are 0, 0.5, 1, 2, 3, 4, 5, 7, 9, 11, 14, 17, 20, 23, 26 parts per million silica. For readings above 26, we use a special nessler jar with a ground glass stopper. We seal these standards. The 100 c.c. standards are 26, 32, 38, 44, 50, 65, 80, 95, 120, 150, 180. For turbidities above 180, dilutions are made with clear water.

During 1913, we made over 24,000 tests with these standards. We have standards made in 1907 still in use. These have been checked from time to time and have not been found to change. We would not recommend using standards over six months without checking.

This method, while it is ideal for the preparation of standards which can always be duplicated, involves considerable labor in the preparation of the diatomaceous earth. The introduction of Fuller's earth seems to be a step in the right direction. I believe this was first brought out by Dr. E. C. Levy, of Richmond, Va., in a paper before the Laboratory Section of the American Public Health Association, although in the report for 1912, he is not given credit for it. The idea, of course, is to do away with the tedious grinding and to obtain a standard which resembles more closely the turbidity of water caused by clay.

Working, then, with two objects in view, of having a definite weight and a definite degree of fineness (obtained by suspension for a definite period) we have experimented with Fuller's earth and have prepared standards which check exactly with our standards made with diatomaceous earth. Our method follows:

If a 200 mesh sieve is not obtainable take about 20 grams of Fuller's earth; if a sieve can be obtained, take about 5 grams of the sifted material (weighing is not necessary). Place in a gallon bottle and add about a quart of distilled water, shake thoroughly, as above, and suspend for ten hours. Decant and determine the weight of the material remaining in suspension by filtering 100-200 c.c. through a weighed Gooch crucible. Dry and weigh.

It will probably be necessary to coagulate the material by the use of a known weight of hydrate of alumina or a solution of alum. In this latter case, the water should be alkaline to precipitate the alum.

The total weight will be the weight of the material in solution plus the weight of the hydrate of alumina.

We know then the degree of fineness as we have suspended for a definite period and we have a known weight. From this suspension we can make our stock for use in preparing our standards.

I do not know just how long the standards will keep, as the period elapsing since their preparation is relatively short compared with our other standards, but in any case it is a simple matter to prepare new ones.

PROGRESS ON HARLEM RIVER TUNNEL.

The sinking of the fifth and last section of the tunnel under the Harlem River, New York City, which is to be a part of the Lexington Avenue subway, has been completed. The tunnel is being built by submerging massive sections of steel tubes which, when connected in position, will be surrounded by concrete and form the bore of the completed tunnel. The procedure is similar to that followed in building the Michigan Central tunnel under the Detroit River at Detroit. The final section, now placed in position, is 250 ft. long. The other four sections are 220 ft. long. The sections are constructed on dry land, and the whole structure is floated into the river by its own bouyancy. Water is then let into the tubes, which are gradually sunk into place, two large floats being used to support the tubes as they are being lowered.