We may well ask is this a new idea, and answer no, it is new in this, that when it was used, we were not familiar with bacterial infection, and the action was concluded to be a chemical precipitation of organic matter only, but it was recognized that the water was purified.

Its suitability to the present case can be freely considered, the qualities claimed for Chlorinated Lime are possessed to a sufficient degree in accessibility and cheapness, and when we come to its results on the basis of our knowledge of it, we may well assert that it will be found efficient in every way.

We eliminate the one pronounced disagreeable element of a bad taste in the water. We introduce an astringent compound which is immediately exerting its action on organic contamination. The astringent quality provides that albuminous and gelatinous bodies would be efficiently dealt with, apart from the destructive effect of Chlorine, but which of course is involved with this astringent effect, and the threefold action is exerted, chemical action, astringent action and precipitation action.

We are correct in the assertion that this substance, Chloride of Iron, will be the right material to use in the purification of drinking water.

We must furthermore conclude that sewage would be as satisfactorily purified by this chemical, the process followed through, gives the same conclusion, quantity only would be the factor.

COSTA RICA AND GUATEMALA SANDS.

Samples of Costa Rica and Guatemala sands were recently secured by a representative of the Aberthaw Construction Company, while on a visit to Central America.

These sands, which were obtained from such cities as Port Limon and San Jose, Costa Rica, and Puerto Barrios and Guatemala City, Guatemala, were tested by Mr. H. L. Sherman, of Boston. Their tensile strength with one part Portland cement and three parts sand by weight compared with that of one part Portland cement and three parts standard sand by weight under the same conditions of test showed that in general the Costa Rica sands were better than those of Guatemala, and also that the sands at present being used for local buildings were undoubtedly the best available. The results of these tests are presented in the following table:—

Costa Rica Sands.

Sample No. 1.—Average tensile strength pounds per sq. inch 1 part Portland cement, 3 parts sand.

	7 days		28 days	
	Costa Rica	Standard	Costa Rica	Standard
3,614	282	332	451	411
3,615	247	332	389	411
3,635	161	203	269	328
3,636	167	203	246	328
3,637	133	203	193	328

Guatemala Sands.

Sample No. 2.—Average tensile strength pounds per sq. inch 1 part Portland cement, 3 parts sand.

	7 days		28 days	
	Guatemala	Standard	Guatemala	Standard
3,634	96	250	169	340
3,649	132	270	146	404
3,650	82	270	137	404
3,651	168	270	208	404
3,652	229	270	308	404

BALLAST.*

George W. Vaughan,

Engineer Maintenance of Way, New York Central and Hudson River Railroad.

Ballast in that portion of the permanent way of a railway which forms the firm and dry foundation for the ties and rails, which they support. It is sometimes distinguished as sub-ballast, ballast proper, and top-ballast. Sub-ballast is that portion used as a foundation for the ballast proper, or as a mat between the ballast proper and sub-grade, made necessary on account of the poor material forming the sub-grade. Ballast proper, or under-ballast, is that which lies wholly below the ties and above the sub-ballast. Top-ballast is that which is filled in around from the bottom to the top of the ties.

Ballast is necessary for the following reasons:—

(a) To drain water from the ties.

(b) To provide a firm and even bearing for the ties and to distribute the pressure from the ties and to hold them in place.

(e) To prevent the growth of grass and weeds in the track.

(f) To allow surfacing and raising of track without disturbing the roadbed.

Ballast is a most important item and upon its quality depends the condition of the track, also the economy in maintenance and operation.

Ballast material should be carefully selected. A dusty ballast will cause greatly increased wear in the equipment and on roads with extensive passenger traffic an innumerable number of complaints from the traveling public, and it is as important to avoid dust and dirt by the use of clean ballast as it is to avoid smoke and dirt by the use of hard coal for fuel.

The best ballast is that which will best form a durable support to the ties, will not change its consistency when wet, will not disintegrate upon exposure to the elements, retain its solidity and position under the effects of traffic, gives good drainage, be free from dust and make an easy-riding track.

Broken stone and furnace slag drain readily, but burnt clay, sand, etc., will retain water more or less and will heave in frosty weather. With earth or mud ballast good drainage is absolutely essential to enable the track to be kept in safe and fairly good condition, as water-soaked earth becomes pasty and squashes up between the ties and over the right-of-way, and when in such condition it is impossible to tamp, so as to keep the track in surface.

A good depth of ballast will cheapen the maintenance by keeping the beds of the ties well drained, and it is not economy to economize too much on ballast.

The depth of ballast varies on different lines and according to the practice of different engineers. The following may be taken as ordinary limits:—

Sub-ballast	10 in. to	18 in.
Lower-ballast	9 in. to	18 in.
Upper-ballast	6 in. to	8 in.
Totals	25 in. to	44 in.

* Abstracted from Bulletin No. 136 American Railway Engineering Association.