Pure Phosphoric Acid.

A known quantity of pure calcium phosphate is gradually added to a slight excess of pure dilute hydrofluoric acid, contained in a leaden or platinum vessel, the mixture being well stirred after each addition. According to the *Compt. Rend.*, an energetic action takes place and considerable heat is evolved. When all the calcium phosphate has been added, the high temperature of the mixture must be maintained for some time in order to complete the reaction. After the removal by filtration of the calcium fluoride which is formed, the solution of phosphoric acid is evaporated. At the point when the solution commences to become viscid, the excess of hydrofluoric acid used is volatilized. The evaporation is continued until a thick sirup, containing 60 to 70 per cent of phosphoric anhydride, is obtained. Meta and pyrophosphoric acids may be prepared by further continuing the evaporation and heating.

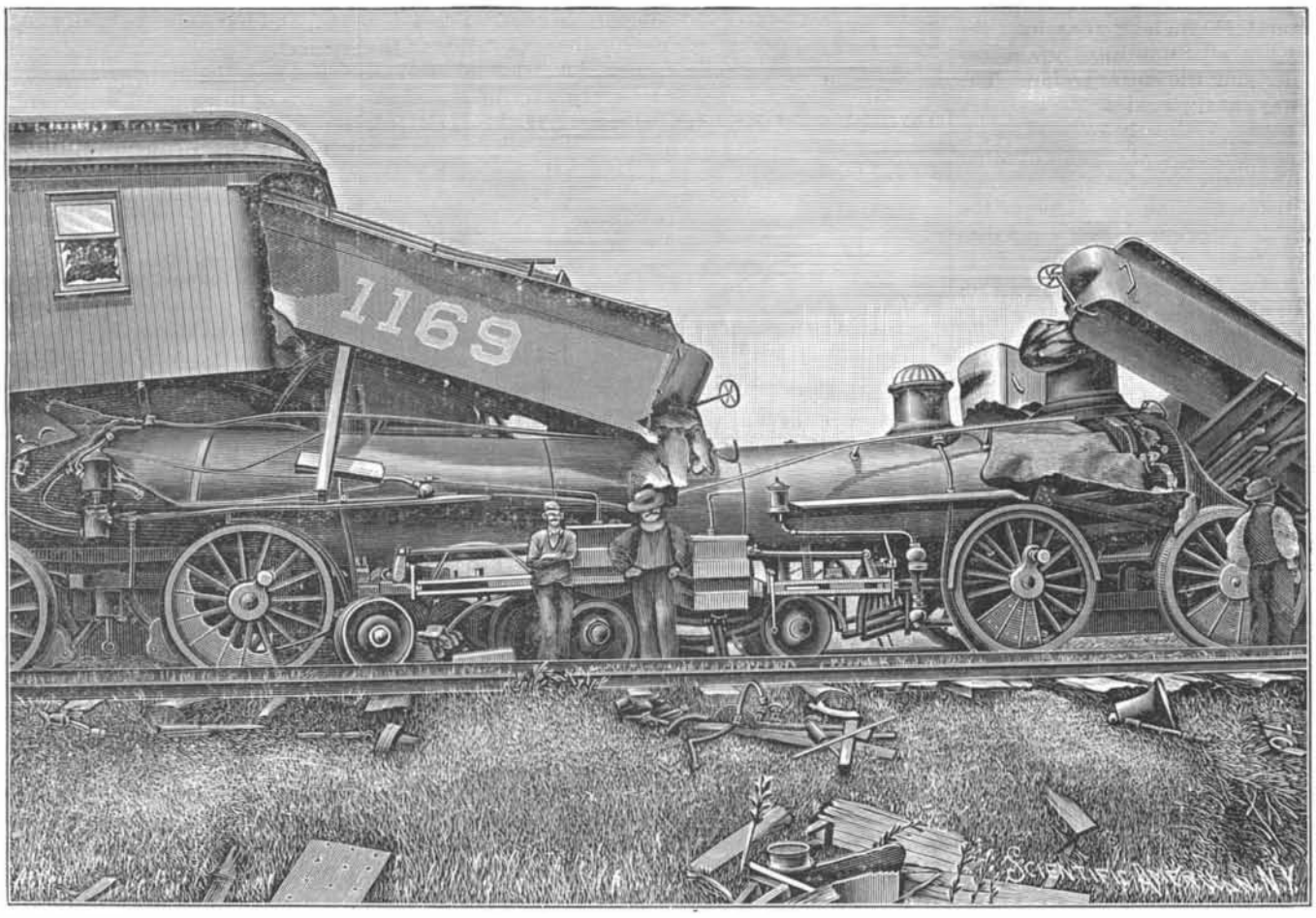
The various calcium salts of phosphoric acid described by Erlenmeyer may be readily prepared by adding hydrofluoric acid to a large excess of calcium phosphate, and after mixing well, dissolving out with warm water the acid salts produced. Impure phosphates, such as bone ash, may be used for the preparation of phosphoric acid, provided that the resultant acid, after being evaporated to carbonize the organic matters present, is diluted with water, filtered and again evaporated.

RAILWAY COLLISION, ILLINOIS CENTRAL RAILWAY.

Our engraving is from a photograph of a pair of locomotives on the Illinois Central Railway as they appeared after a collision. Four persons were killed and six injured. The New Orleans *Picayune* says: "At 9:45 on the night of June 19, 1891, the north bound mixed freight train on the Illinois Central Railway sidetracked at Savage station, about five miles from the city, in order to give the south bound cannon ball passenger train a clear track. By some unaccountable means the switch was left open and the passenger train, going at full speed, dashed into the freight train, derailing all of the cars except the sleepers.

"The cars telescoped, the mail car being thrown on top of the two engines, which were total wrecks. Engineer Mitchell, of the passenger train, was fatally injured, and both firemen, Munn and Lawson, one white and one colored, were instantly killed, being jammed between two boilers."

The two locomotives came together with such force that they appeared to be welded together.



RAILWAY COLLISION, ILLINOIS CENTRAL RAILWAY.

Rapid Marine Engine Fitting.

A smart feat of engineering has been performed at the Central Marine Engine Works, West Hartlepool, England, in the rapidity with which the screw steamer Silvia has been fitted with her machinery. The vessel was launched about 4:30 P. M., on Tuesday, June 23, from Messrs. Irvine's shipyard, and proceeded under the sheerlegs at the Central Engine Works. The engines, which are of 500 indicated horse power, together with the large boiler and funnel and all the connections and fittings, were fitted on board in twenty-four hours; the making-up lengths of steam pipe, the ladders, gratings, and platforms were fitted and steam got up in the boilers, and the engines satisfactorily steamed in presence of the surveyors at 10 A. M. on Friday, June 26, the vessel steaming back to her berth in two and one-half days from the time she left the stocks. This is an illustration of the advantages of modern machinery and organization in facilitating the output of marine machinery, and it is believed that so large a set of machinery has never previously been put on board in this short space of time.

A New Refrigerant.

Chloride of methyl is useful as a local refrigerator, but requires an expensive apparatus to utilize it. Dr. Redard, of Geneva, has therefore substituted chloride of ethyl in producing local anæsthesia by refrigeration. It is a colorless liquid of an agreeable odor, and is contained in a sealed tube of glass. When the point of the tube is broken off with pincers, the liquid is allowed to escape in a jet directed on the part to be cooled. The jet can be readily stopped by the finger or a little wax. Each tube holds ten grammes of the ethyl, a quantity sufficient for most operations. Dr. Redard has found it useful in cases of sciatica, neuralgia, and toothache. The new refrigerant is likely to be serviceable in the laboratory. If the jet be directed on a tube containing water, the latter will freeze.

Immigration During Seventy Years.

The immigration into the United States from 1820 to 1890 is the subject of a special report which has been prepared by Major Brock, the chief of the Bureau of Statistics of the Treasury Department. No official record was made of the influx of foreign population to this country before 1820, but the immigration from the close of the revolutionary war to that time is estimated at 225,000. The arrivals of immigrants from 1821 to 1890 were 15,641,688. The arrivals from 1821 to 1830 were 143,439; from 1831 to 1840, 599,125; from 1841 to 1850, 1,713,250; from 1851 to 1860, 2,598,214; from 1861 to 1870, 2,466,752; from 1871 to 1880, 2,944,295; and from 1881 to 1890, 5,176,212.

The following figures give the arrivals of each nationality during the entire period from 1820 to 1890: Germany, 4,551,719; Ireland, 3,501,683; England, 6,460,054; British North American possessions, 1,029,083; Norway and Sweden, 943,330; Austria-Hungary, 464,435; Italy, 414,513; France, 370,162; Russia and Poland, 356,353; Scotland, 329,192; China, 292,578; Switzerland, 176,333; Denmark, 146,237; all other countries, 606,006.

The only leading countries from which arrivals have fallen off in the last ten years are France and China, the total immigration from France from 1871 to 1880 having been 73,301, and from 1881 to 1890, 51,440. The immigration from China amounted to 122,436 from 1871 to 1880, and 51,469 during the years 1881 and 1882, after which the Chinese exclusion bill went into effect.

The year of the largest immigration yet reported was that which ended on June 30, 1882, when the arrivals were 788,992. The immigration from Italy to the United States was 15,401 for the fiscal year 1881, and steadily increased until 1890, when it was 52,003, and the present year, ending June 30, 1891, when the total for ten months has reached 51,153, as against 34,310 for the corresponding months of 1890. The immigration from Hungary amounted in 1881 to 6,826, and in 1890 to 22,062. The figures for ten months of the present year are 22,496. The immigration from Russia and Poland also shows a rapid increase, from 10,655 in 1881 to 46,671 in 1890, and 53,350 for ten months of the present year.

The classification of immigrants during the past decade as to occupation shows that only 26,257 males were of the professional classes, 514,552 were skilled laborers, 1,833,325 were of miscellaneous occupations, 73,327 made no statement in regard to occupation, and 759,450 were without occupation.

The American Society of Microscopists.

This society will hold its thirteenth annual meeting in Washington, D. C., August 10, and will continue in session for five days. Its roll of active members comprises about three hundred and fifty names, including the majority of microscopists in the United States. Every person interested in microscopy should belong to this society, whether able to attend its annual meetings or not, as the reports are well worth the small sum paid for annual dues. The qualifications for membership are simply that the applicant must be respectable socially and interested in the use of the microscope.

We have no doubt a rich treat is in store for microscopists who can attend the Washington meeting.

The present officers of the society are as follows:

Frank L. James, editor St. Louis *Medical and Surgical Journal*, President.

W. H. Seaman, No. 1424 Eleventh Street, Washington, D. C., Secretary.

C. C. Mellor, No. 77 Fifth Avenue, Pittsburg, Pa., Treasurer.

The Cable Speed of Electricity.

The experiments now in progress at McGill College, Montreal, under the auspices of the British and Canadian governments, to ascertain the longitude of Montreal by direct observations from Greenwich, have led to the accomplishment of a remarkable telegraphic feat. The English papers report it thus: "The first thing to determine was the length of time it took a telegraphic signal to cross the Atlantic. An automatic contrivance, whereby the land line could work into the cable, was provided, and a duplex circuit was arranged, so that the signal sent from Montreal would go over the land lines to Canso (Nova Scotia), thence over the cable to Waterville, Ireland, and return to Montreal again. Attached to the sending and receiving apparatus was a chronograph, which measured the time. Out of two hundred signals sent, it was found that the average time taken to cross the Atlantic and back again—a distance of 8,000 miles—occupied a trifle over one second, the exact time being one second and five-hundredths. Professor McLeod is carrying on the experiments with Mr. Hosmer, the manager of the Canadian Pacific telegraphs.

A Young Woman Obtains an Engineer's License in Chicago.

Chicago is a great city, enterprising to an astonishing degree, and in more than one respect is unlike any other city on this continent. She gained the world fair site over all her competitors, and she now has a woman engineer, who has successfully passed the ordeal of a rigid examination.

A contemporary says she was not let off easily either because she was a woman; in fact, the writer says her examination was, if anything, a little more severe than usual.

The young woman walked into the Board of Examiners' room in the City Hall, presented her application in a manly way, deposited the official fee (two dollars), and then made her way into the line of the applicants to await her turn.

Among other questions she was asked was as to the size of the blow-off required for a seven horse power engine, and what she would do if the valve stuck fast. When the examination was finished, the examiners wrote at the end of her paper "accepted," and Miss De Barr is now a full-fledged licensed steam engineer.

THE cost of a palace sleeping car is $15,000; or if "vestibuled," $17,000.