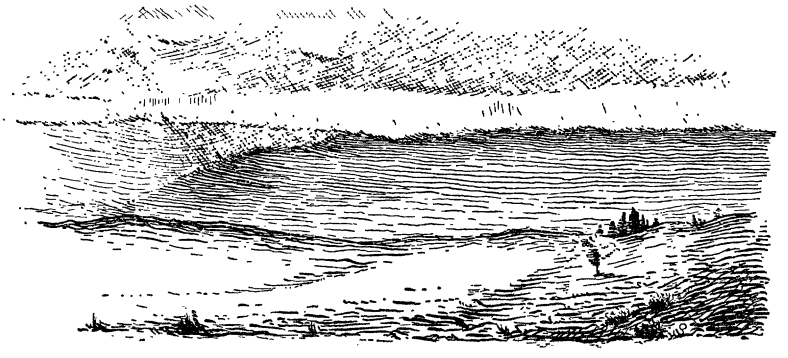
measures were successful, and we discussed what had ailed us. According to George, our hats, becoming damp, had been charged like Leyden jars and, growing overcharged, had unloaded into our heads.

I have made no attempt to change and render more dignified the somewhat informal character of this chronicle. It was written a few hours after the experience in the hail-storm which had not reached the valley where our camp was. When we returned there, we found the aspect of summer as unchanged as when we had left it in the morning. On the top of the mountains the hail stayed only a few hours beneath next day's sun. As we continued our hunt for mountain sheep, there was not a trace of it.

OWEN WISTER

PHILADELPHIA,
November 21, 1908



A NOTABLE CLOUD BANNER

TO THE EDITOR OF SCIENCE: Early in July, 1907, an exceptionally fine cloud banner formed on the southern end of the Bridger range in southwestern Montana. This range, an isolated outlier of the Rockies, trends north and south, thus acting as an obstruction to frequent squally and showery northwest winds which approach it across the Gallatin Valley to the westward. On the occasion mentioned, the writer was camped six miles east of the southern end of the range. Brisk thunder showers from the northwest had occupied most of the afternoon until about five o'clock, after which the sky remained overcast with nimbus and occasional flying patches of fracto-nimbus. Presently little cloud caps began to form on the range, as a result of the adiabatic cooling of a northwesterly air-current forced to rise in crossing the obstruction. They grew rapidly, very soon uniting into a long cloud cap over the whole visible length of the range (five or six miles) and trailing off to leeward from its southern end to a distance of two—a cloud seven or eight miles long in all. The ragged end at intervals sent off scraps resembling fracto-nimbus, which were gradually dissipated as they drifted away from the parent cloud.

The spectacle of a cloud-waterfall over Bridger Peak, the highest portion of the range visible from camp, was nothing short of magnificent. Enormous billowing masses surged one after another across the peak, cascading down the leeward slopes and vanishing in succession as a result of adiabatic warming.

There was no associated standing cloud to leeward. Either the obstruction offered by the range to the passage of the air-current was insufficient, or the current itself was too weak, to set up a secondary wave high enough to raise the air again to condensation level. In this respect the Bridger cloud differed from the clouds over the Cross Fell range in northwestern England, where the famous Helm Bar often tops the crest of a long standing wave to leeward of the mountains. Its occurrence is described by Brunskill in the *Quart. Jour. Roy. Met. Soc.*, X., 1884, 267–275. Professor W. M. Davis reports a similar case for the Cevennes in the *M. Z.*, XVI., 1899, 124–125.

The present phenomenon lasted about two hours, though in its best development not more than an hour. Toward the end the banner gradually decreased in length, the cascading stopped, the cloud cap broke into isolated patches, until finally only a few bits of gray mist remained clinging to the summits.

The accompanying sketch of the southern two thirds of the cloud was made by Mr. H. W. Packard, of Brockton, Mass., from a photograph taken by the writer.

B. M. Varney

Harvard University,
May 19, 1908

THE TRAINING OF INDUSTRIAL CHEMISTS

To the Editor of Science: May I be permitted to offer a few remarks on Dr. Chas. S. Palmer's recent letter[1] regarding the training of industrial chemists and may I correct at least one rather important error into which he has fallen? He says (p. 726):

> But the quotations also show another thing, namely, that Professor Kipping has never been in active responsibility of a chemical works [*sic*] and really does not understand practical industry.

As a matter of fact Professor Kipping had a very active responsibility in a very large chemical works for a number of years, before he became a teacher.

So far as industrial chemistry is concerned, it will probably be admitted that Germany is highly successful in chemical manufactures and that, broadly speaking, England and the United States are not.

It is well known that in the successful German, American and English works two classes of chemists are employed, the "combined analytical machine and foreman" and the investigators. Before being engaged these latter spent eight or more years in obtaining a *chemical* training, and they have to demonstrate their ability to carry out research—by carrying it out. In the English works from which the loudest complaints come—and I believe that the same is true of the United States—it will be found that their "chemist" is a man of very partial training, which seldom exceeds, if indeed it equals that represented by a bachelor's degree. Not only has this unfortunate person had no practise in research, but, as a rule, he is loaded down with routine tests and analyses, and then the manufacturer wonders loudly why the profits do not increase. It speaks volumes for the native ability of his "chemist" that there are any profits at all. In the meantime the dividends of the German works continue to grow.

Judged by results, can there be any doubt which is the better system?

Practically, every technical problem is divisible into two parts. One is purely chemical and deals with such questions as the nature of a reaction, or the conditions affecting the yield of a substance. The second is more essentially engineering and is concerned with containers, transportation, design or construction of plant, etc. We know, however, that in order to carry out successfully independent investigations in pure chemistry, a man must have a suitable mind and, after leaving the high school, must spend about eight years in training. Nevertheless, some manufacturers take an individual who has had only *four years study of chemistry and engineering combined* and expect him to solve problems in *both subjects*. Moreover, certain of these employers are willing to pay as much as $600 per annum to the prodigies in question!

Dr. Palmer's reference to the numerous "fine young students" who "have information by the brainful"—whatever that may mean—is rather funny. His complaint that they can not "apply one thousandth part of what they know" simply proves that they have not been trained in research work. It would be interesting scientifically to be informed exactly as to how much chemistry is represented by 0.001 of the total chemical knowledge of these wonderful "fine young students." It would be more than interesting to encounter one of Dr. Palmer's theories arrayed in overalls, or indeed, in any other garments!

J. Bishop Tingle

McMaster University,
Toronto, Canada,
November 23, 1908

[1] Science, XXVIII., 725, November 20, 1908.