but had either been obscured by steam or fog, or had been neglected owing to the carelessness of the engineer. In one instance the engineer, while attempting to repair a leaking valve, apparently forgot to watch his signals, for, although five separate warning lights were set for him, he plunged his engine into a stalled train, causing a fearful loss of life.

Accidents of this sort cannot be blamed upon the block signals, but obviously, in addition to these signals something more is needful which will force the attention of the engineer to the signals and impel him to act, or in case he does not act, will automatically throw the throttle and operate the brakes for him. Very evidently, visual signals alone are inadequate, particularly when they are set at the side of the road, where smoke or fog can intervene between them and the engineer. In addition to the visual signal an audible signal should be used, to draw the engineer's attention even when the usual semaphore is invisible.

A number of systems have been invented, which provide for operating signals in the cab of the engine directly before the eyes of the engineer. Such a system, which is now being tried in England, was described in these columns a few weeks ago. It comprised a pair of semaphores in the cab adapted to show "danger" and "caution," and a horn which was sounded when the danger signal was set. In addition to this the steam was cut off and the brakes set automatically, in case the signals were disregarded by the engineer. These cab signals were controlled by trippers along the track, which were set by a signalman.

In the accompanying engraving we illustrate a somewhat similar cab signal system, belonging to the Safety Signal Company, of 407 Drexel Building, Philadelphia, Pa. This system, however, differs from the English system in the fact that it is controlled directly by the regular automatic block signals, repeating these line signals in the cab. The line drawing illustrates diagramatically the method of transmitting the signals to the cab. Close to one of the rails are a pair of blocks, only one of which is shown in the diagram, as the two blocks and the mechanism connecting them with the line signal system are identical. The block *A* is mounted to slide vertically in a chamber secured to the ties. A coil spring bears against the under face of the block, tending to hold it up to the desired height. The object of fastening the chamber to the ties instead of burying it in the roadbed is to preserve the same relative position between the rail and the block regardless of any settling of the roadbed due to frost or other weather conditions. A rod connects the block with a lever *B*, which is hinged to a bracket depending from the chamber. The opposite end of the lever carries a plunger, which is adapted to slide vertically in a cylinder *C*. A pipe connects this cylinder with the compressed-air system of the electro-pneumatic block signal. One of the blocks *A* is controlled by the "danger" signal, and the other by the "caution."

The system is especially adapted to be operated with line signals of the type which are normally set at danger, and show a clear track only when the train is about to enter the block. For this reason, the blocks *A* are normally held in raised position by the coil springs, this position being the one in which they will operate the cab signals, so that in case of any failure on the part of the line signals, the cab signals would show "danger" and bring the train to a stop. When the semaphore signals are set for "clear," both cylinders *C* are connected with the compressed-air system of the line signals, raising the plungers therein, and lowering the blocks *A*. If, on the approach of a train, the "danger" signal should drop, it would throw a valve, releasing the air from its corresponding cylinder *C*, and lowering its respective block *A*. The blocks *A* thus rise or fall with the semaphores.

Carried by the locomotive is a search wheel *D*, supported in a yoked bar *E*, mounted to slide vertically. The search wheel is provided with two treads, one normally running on the rail, and the other, which is of a larger diameter, adapted to engage the blocks *A*. The rod *E* projects up into the cab of the locomotive, and at its upper end is provided with a pawl adapted to engage a ratchet wheel *F*. This wheel is geared to a disk mounted to turn in a casing *G*. The disk which carries a red and a green glass may be swung to show these signals through an opening in the casing *G*. As the locomotive passes over the blocks *A*, if, for instance, the "caution" block is raised, the search wheel *D* striking the block will be lifted, and by means of the ratchet wheel *F* will shift the signal disk until the green signal shows through the opening in the casing *G*. On passing the first block *A*, if the "danger" block is raised, the search wheel will be lifted again, turning the disk to show the red as well as the green signal. At each operation of the search wheel an electric circuit is closed, which operates to ring a bell *H*. The bell *H* will continue to ring until the engineer has broken the circuit and reset the signal disk.

In addition to the signal mechanism, there is an electrically-controlled mechanism *J*, adapted to act directly upon the throttle and brake lever, so that in case of a lapse on the part of the engineer, the train will be automatically brought to a stop. One of the great objections to mechanism for automatically stopping a train, is that it conduces to carelessness on the part of the engineer, who is apt to put too much confidence in the automatic mechanism, and permit it to govern the engine at all times. Since no machinery may be trusted to work forever without failure, there is danger that at some time it may fail while the engineer's attention is drawn elsewhere, and a serious accident would result. To obviate such conditions, the present system employs an indicator *I*, which is driven by clockwork, and on which is recorded every automatic action of the signal apparatus. This indicator shows whether the engineer has operated the throttle himself, or whether he has depended upon the mechanism for doing this work. These records may be examined at the end of each run, and in case they disclose any failure of the engineer to regard the signals and operate the engine himself, he should be severely censured. It is believed that by thus keeping a check on the actions of the engineer, the faults of the automatic system are avoided and its benefits retained. The chances of a lapse upon the part of the engineer, and a failure of the mechanism occurring at the same time, are exceedingly remote. Hence, the safety of a train equipped with this automatic cab signal and control system is doubly assured.

DEATH OF SIR WILLIAM PERKIN.

Sir William Perkin, founder of the coal-tar industry, died last week at the age of sixty-nine years. Few men of science began active life so early and attained success so quickly.

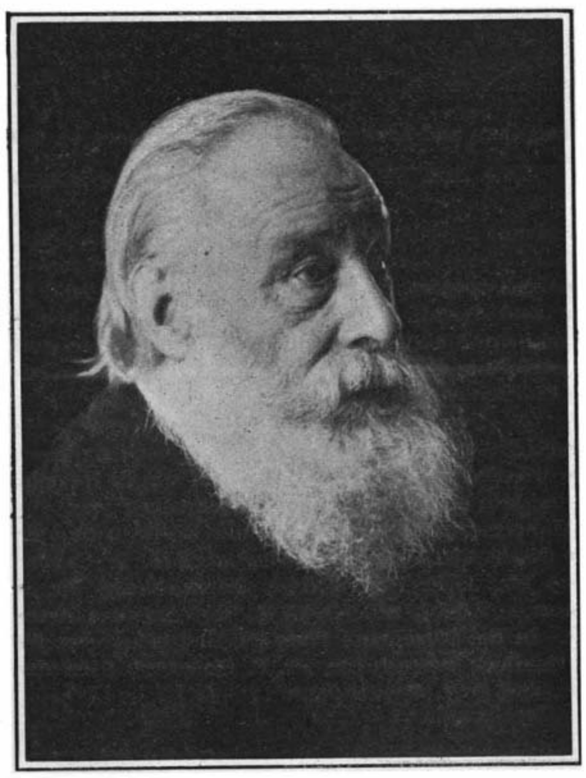

Photo by Vander Weyde.

His early chemical training Sir William received at the City of London School, where, during the noon recess, lectures on chemistry and physics were given by Thomas Hall. At the age of fifteen Perkin went to Dr. Hoffman, who occupied a chair in the Royal College of Chemistry. After having finished his course in quantitative and qualitative analysis, Perkin began research work. Strangely enough, the first subject Dr. Hoffman selected for him was anthracene. The experience acquired in investigating this substance was of immense advantage to him when he began to work on alizarine many years afterward. At the age of seventeen Dr. Hoffman made him an assistant in his experimental laboratory. In that capacity he was occupied all day with his researches. His own work was carried on in the evening in a scantily-furnished laboratory. There it was that in the Easter vacation of 1856, when only eighteen years of age, he discovered mauve. He was led thereto by an attempt to produce quinine artificially from allyltoluidine, which caused him next to study the oxidation of aniline. While experimenting with the dyestuff thus obtained, he found that it was a very stable body which produced on silk a beautiful violet, exceedingly resistant to light. Manufactured in large quantities, it seemed to Perkin that it would be a useful dye. He continued his investigations, and succeeded in interesting Messrs. Pullar, of Perth, in his discovery. On August 26, 1856, the process was patented. Experimental attempts to use the new dye for cotton and other materials proved so successful, that its manufacture was undertaken by Sir William Perkin, his father, and his brother, under the name of Perkin & Sons. His dye was a pioneer, and it cleared the way for all that came after it. It completely revolutionized the dyeing and textile printing industry, and gave rise to an amount of chemical research in the coal-tar colors which is probably without an industrial parallel.

Death of Angelo Heilprin.

Angelo Heilprin, well known for his investigations of Mont Pelée, died on July 17 at the age of fifty-four.

Prof. Heilprin was born in Hungary, but emigrated to this country with his parents at the age of three years. He studied chiefly in Europe. He early made natural history a special study, with such distinction that he was honored in London, 1877, with the Forbes medal. On his return to the United States in 1879 he was made Professor of Invertebrate Paleontology in the Academy of Natural Sciences, Philadelphia. From 1883 to 1892 he was executive curator in the institution. For five years he was president of the Geographical Society of that city, and in 1892 he led the Peary relief expedition to the polar regions.

On May 20, 1902, Prof. Heilprin ascended the volcano side of Mont Pelée while the eruption was still in progress. Arriving at the edge of the summit crater he remained there four hours, and when he descended he was encrusted with mud, the weight of which, together with the atmosphere he had been breathing and the difficulties he had encountered, reduced him to a condition of great fatigue. Nevertheless he ascended the mountain a second time.

Prof. Heilprin was made an officer of the French Academy and was awarded the Elisha Kent Kane medal by the Philadelphia Geographical Society.

Fossils in Egypt.

Some rare fossils have been discovered in Northern Egypt by an exploring party under the direction of Prof. H. F. Osborne, vice-president of the American Museum of Natural History, and Walter Granger and George Olsen, members of the museum staff.

The fossils were discovered in the Fayum Desert, situated a few miles from the Nile Valley. The collection made was put into twenty-seven large packing cases and shipped on a freight steamer, which has already arrived in New York.

The main object of the expedition was to seek the ancestor of the elephant. A very important find was that of the ancestral elephant known as the palæomastodon. The skeleton is not complete, but the skull, the lower jaw, leg and foot bones and several vertebræ were found. A thorough search was made for the missing bones, but with no success. According to Mr. Granger this animal dates back more than a million years.

Another important fossil found was that of a skull of an arsinoitherium, which takes its name from Queen Arsinoe, who reigned 316 B. C. The skull, which is very rare, is the only one in this country, and there are only two in the world. The bones of the body and legs of this animal have never been found.

Among other fossils in the collection are the bones of ungulates and rodents. It is the first time that the fossil rodent was ever found in Egypt, but many have been found in other parts of Africa. Several skulls of the ancient crocodile were found, their heads being from three to four feet long. Judging from the size of the skulls, the bodies must have been from twenty to twenty-five feet long.

In some of the excavations skeletons of the ancient and aberrant whales were found, which existed generations ago. They have become entirely extinct. Ivory teeth that belonged to animals that existed so far back that the time cannot possibly be established were also unearthed.

The American Museum of Natural History has now the largest and rarest collection of fossils in the world.

University of California Will Send Expedition to Observe Next Total Eclipse of the Sun.

William H. Crocker, of San Francisco, has given $4,500 to the University of California for the purpose of defraying the expenses of an expedition to observe the next total solar eclipse, which will occur on January 3, 1908. The eclipse will be visible all over the Pacific Coast. The astronomers of the University of California will also make observations in South America, the precise points not having been selected yet. The University of California has an excellent collection of astronomical instruments, some of which were presented by William H. Crocker. The work done with the photographic apparatus has been particularly successful. The University has received large donations for astronomical purposes from William H. Crocker and D. O. Mills, at whose expense parties were sent out to Labrador and Spain for the purpose of studying an eclipse of the sun.