which illustrate the most important applications of chemistry to the arts. The first two classes are already well represented, and a fair beginning has been made on the third.

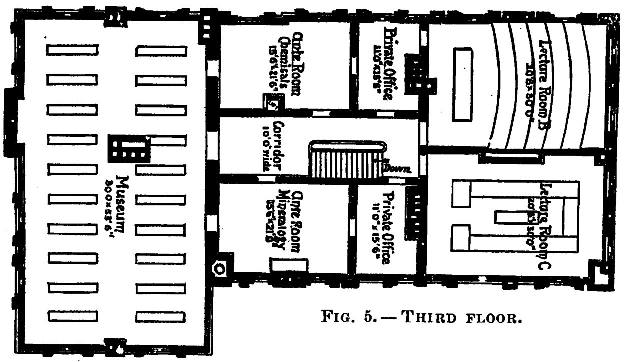


FIG. 5.—THIRD FLOOR.

It is, however, in connection with the third class that the chief additions will be made for some time to come.

On the third floor, in addition to the cabinet, there are two lecture-rooms,—one for chemistry, and the other for mineralogy,—besides two small laboratories for the examination of minerals, and the preparation of specimens for the museum.

There remains only the basement, which is well lighted, and really amounts to an additional story. It is, of course, largely taken up by storerooms and the heating-apparatus; but there are, in addition, two convenient large rooms, which have been fitted up for furnace-operations. In one of these are, among others, two smelting-furnaces of the extremely convenient form in use in the assay-laboratories connected with the U. S. mints. All the necessary conveniences for assaying ores have been secured, and it is intended that all students of pure chemistry shall at least know what assaying is. It is not proposed to go into the teaching of applied chemistry in any narrow sense, but rather "to afford the thoroughly-trained chemist an opportunity to familiarize himself with some of the more important applications of his science."

In conclusion, it should be stated distinctly that the laboratory not only works well on paper, like some of the chemical reactions which students are wont to originate, but, as a matter of fact, it has been found to be extremely convenient and practical. The flues draw in the right direction; the desks are large enough, more space being allowed each individual than in any laboratory known to the writer; the light is good; the water and gas supplies are ample: in short, no serious complaint has been made against the working of any essential feature, though a large number of students have been constantly engaged in it during the year. It is believed that in its present condition it affords facilities for every kind of chemical work. 'Conveniences' have not been unduly multiplied, as the director's experience has led him to the belief that it is possible to make a laboratory so extremely convenient that it

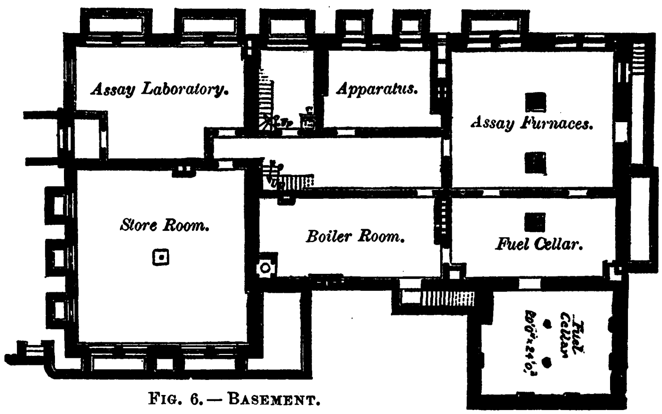
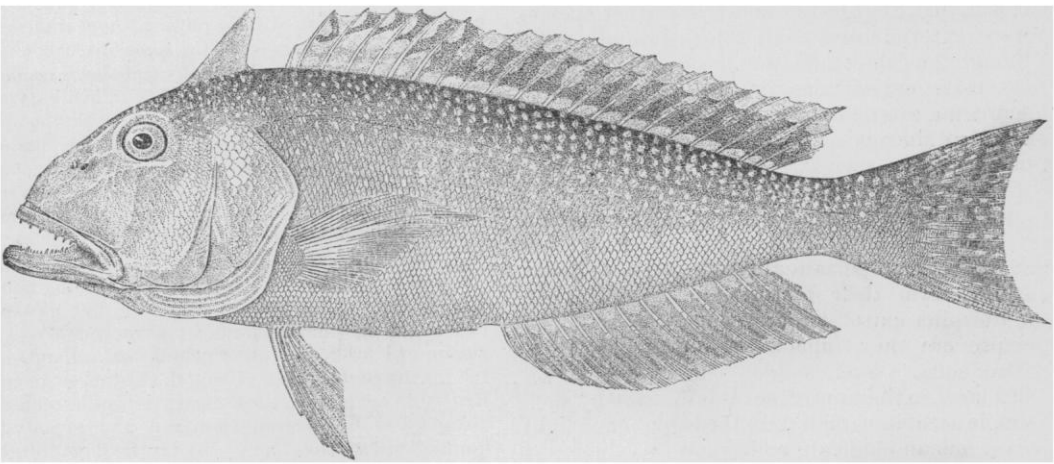


FIG. 6.—BASEMENT.

is difficult to work in it. It may safely be asserted that all really valuable forms of apparatus or arrangements for special operations have been taken into account, and embodied in the building.

THE TILE-FISH.

IN the spring of 1879 a Gloucester fishing-schooner, accidentally fishing on the Gulf-Stream slope south of New England, found in abundance a fish which later proved to be new, and was described under the name of Lopholatilus chamaelionticeps, but which the fishermen named tile-fish. The fish-commission later found that it possessed excellent edible qualities; and the prospect of thus adding a new fish to our east-coast food-fishes created a stir at the time. So bright were the prospects, that a fishing-vessel was even being fitted out for the purpose of catching this new fish, when, in the early spring of 1882, reports were brought in by vessels that dead tile-fishes were seen floating in immense numbers over areas of many square miles. These dead or nearly dead fishes were floating, belly upward, all the way from off Cape Hatteras to Nantucket, and in such numbers that there were in one case estimated to be fifty in a square rod. As they weighed from five to fifty pounds, even allowing for exaggeration, the sight must have been strange. They were examined, and found to be perfectly healthy, and some were eaten. All were not dead, but some seemed to be benumbed; and, when placed in the sun on deck, they revived sufficiently to move the muscles slightly. There were some other fishes among them in a similar condition; but, as none were saved, the species cannot be identified. This great abundance of paralyzed fishes on the surface, without any apparent reason, attracted much attention, and many causes were ascribed to explain the phenomenon. The fish-commission itself made inquiries; and the following startling statistics concerning the number of dead fishes are taken from Capt. Collins's official report. They covered 4,250 square miles; and, if one-twentieth of the number recorded by the man who saw the most be taken as an average number for the area, we have a total of 1,438,720,000 fishes. Even if we allow only one fish where the observer reported 400, we still have an astounding total of 71,936,000 fishes. Taking ten pounds to be the average weight, we find that there were 719,360,000 pounds of dead fish on the surface. The extreme abundance of these fishes was never imagined before their destruction. This destruction is not without parallel; for in certain bays on the coast of Labrador, when icebergs have grounded, cod have been killed in great numbers by the sudden decrease of temperature, and their bodies washed ashore. In Texas, during the Mexican war, after a very cold night, enough fishes were washed on the beaches in a benumbed condition to furnish food for Gen. Taylor's whole army. Other cases are recorded where volcanic action has caused similar destruction. Of the theories suggested to explain the destruction, all were discarded but that of cold water. Volcanic action could not be used to explain it, because there was no disturbance; and disease would not account for the phenomenon, because all the fishes were perfectly healthy.



THE TILE-FISH.[1]

The tile-fish is a warm-water fish, and belongs to a family which is peculiarly a tropical group. The part of the ocean which these fishes inhabit is a portion of the rapidly sloping Gulf Stream slope. A narrow belt in this region, having a depth of from seventy to a hundred and fifty fathoms, is so influenced by the Gulf Stream as to have a nearly uniform temperature of about 50° F. the year round. On either side of this belt is one of much colder water. The inner shallow shore-water often descends in winter below 32° F., and beyond to the great ocean-depths the temperature gradually descends. This belt, being so much warmer and more uniform in tempera-

[1] Reproduced from a drawing loaned by the U. S. fish-commission, as were the cuts on pp. 337, 338, vol. iv.

ture, is, as a natural consequence, inhabited by a different fauna; in fact, by a tropical deep-sea fauna, an extension of that of the West Indies. Not only the tile-fish, but certain crustaceans, are examples of these. Naturally they would be sensitive to cold. During the spring of 1882, violent and long-continued easterly and northerly winds prevailed, and numerous icebergs stranded on the George's Banks just north of the belt. We have every reason for believing that these winds carried the inshore waters, which were naturally cold, but whose temperature had been lowered by the stranded bergs, across the border-line and into the warm area. If this were the case, such delicate animals as the tile-fish could not possibly stand the sudden change which their more hardy neighbors could easily live through. So it was that the tile-fish and a few other species were exterminated from these grounds. Although the fish-commission has organized many extensive expeditions for the sole purpose of searching after the tile-fish, not a single specimen has since been found, either of the tile-fish or the other species. Whether or not they still exist in waters more southern is an open question; but we understand that Professor Verrill believes they will be found there. At any rate, it is certain that they are entirely absent from their former haunts, and that, if they do exist elsewhere, many years must elapse ere they inhabit this bank again in abundance. Such sudden changes as these, and local extinction of several species by such simple means, cannot help throwing much light upon paleontological geology.

RALPH S. TARR.

COMETS AND ASTEROIDS OF 1884.

WHILE the year 1884 has brought no comets of remarkable brilliancy or popular interest, compared with the comets of 1881 or 1882, nearly all the comets of the year will claim more than ordinary attention at the hands of astronomers, on account of the interest which attaches to the investigation of their orbits. Of the five comets seen, four have been periodic.

The first comet which was discovered in 1884 belongs properly with the comets of the preceding year, as it passed perihelion on Dec. 25, 1883. It was discovered, however, on Jan. 7, 1884, by Ross, an amateur observer, at Elsternwick, near Melbourne, Australia, — "a faint nebulous object, with an ill-defined central condensation, and a small, tail-like projection." It was not visible in the northern hemisphere, and was under observation for only about a month. The tail was one and a half degrees long on Jan. 18, 1884.

The first comet of 1884, in order of perihelion passage, was that discovered, or rather re-discovered, by Brooks, at Phelps, N. Y., on Sept. 1, 1883. It has been commonly known as the Pons-Brooks comet, or Pons comet of 1812, having been originally discovered by Pons at Marseilles in that year. An account of this comet has already appeared in *Science* (iii. 67).

The second comet, in both order of perihelion passage and of discovery, was that found by E. E. Barnard of Nashville, Tenn., on July 16, 1884. At the time of discovery it was a nebulous object, slightly condensed near the centre, and tolerably bright. It was found to move in an elliptical orbit with a period of about five and a half years, the elements bearing a very close resemblance to those of DeVico's comet (1844, i.). The comets do not, however, appear to be identical. The nearest approach to the sun was on Aug. 16.

The third comet of 1884 was discovered on Sept. 17, by Wolf, a student at Heidelberg, and is still under observation. In its physical appearance, the comet has changed very little since discovery. As far as I know, it has not at any time been visible to the naked eye, nor has it shown any indications of a tail. When examined on Nov. 13, with the nine-inch equatorial at the Naval observatory, under a magnifying-power of one hundred and two diameters, it presented the appearance of a 'slightly oval, nebulous object.' Near the centre of the nebula was a bright disk nearly circular, and in the centre of this disk the stellar nucleus. The line of demarcation between the disk and the surrounding nebula was, of course, extremely uncertain; but measures made with the filar micrometer gave, roughly, a diameter of 1′ 52″ for the outer nebula, and a diameter of 18″ for the central disk. Using the distances given in Krueger's ephemeris, these measures would represent distances of forty-seven thousand and seventy-five hundred miles respectively. By far the most interesting feature of the comet is its orbit. Krueger has assigned a period of about six and seventh-tenths years, but there is no evidence of any previous appearance. He remarks that at the returns in 1871 and 1878 it was unfavorably situated. In 1891 and 1864 its situation is favorable, if we can suppose that it follows the same path as at present. Krueger points out, furthermore, that in the early part of 1875 the comet must have suffered considerable perturbation by Jupiter, and before that time it may have been following an entirely different orbit. Perihelion was passed on Sept. 26.

Encke's comet, the most interesting short-period comet, has just been reported by Professor Young. It is extremely faint, but will grow somewhat brighter. It will not reach perihelion till March, 1885.

To complete the list, we should mention a 'suspected' comet to which some interest is attached. A faint, round, nebulous object was found by Spitaler with the twenty-seven inch refractor of the Vienna observatory, while searching for comet 1858, iii., on the morning of May 26, 1884. Unfavorable weather prevented a re-examination of this place till June 17 and 18, when the object could no longer be seen, nor