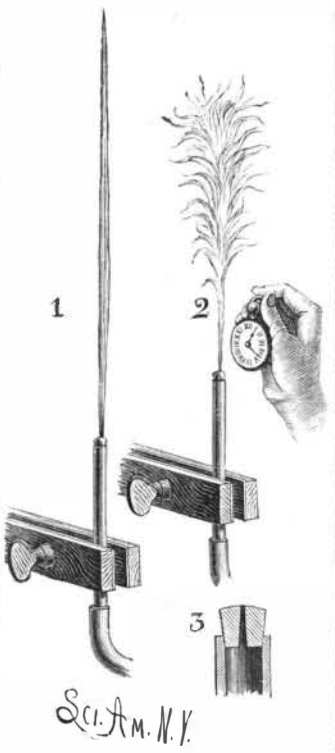
SENSITIVE FLAMES.

BY GEO. M. HOPKINS

The sensitive flame observed by Dr. Le Conte and afterward developed by Tyndall exhibits some of the curious effects of sound. For its production it is necessary that the gas be under a pressure equal to that of a column of water six or eight inches high. The common method of securing the required pressure is to take the gas from a cylinder of compressed illuminating gas, such as is used for calcium lights. Another method is to take the gas from a weighted gas bag, and still another is to fill a sheet metal tank with gas and displace it with water in the manner illustrated in Fig. 4.



BURNER FOR SENSITIVE FLAME.

The burner is shown in Figs. 1, 2, and 3. It consists of a small tip inserted in the end of a suitable tube. The tip in the present case is made of brass, but those commonly used for this purpose are of steatite. They are superior to the metal ones, but quite expensive. The writer is indebted to Professor W. LeConte Stevens, of Brooklyn, for a hint on this point. Professor Stevens has found that some of the lava pinhole burner tips used in certain kinds of gas stoves answer admirably for this purpose, and cost very little. A tip with a round, smooth hole is to be selected. The bore of the tip is here shown tapering. Its smaller diameter is 0·035 inch. The burner is supported in the manner shown in Figs. 1 and 2 or in any other convenient manner, and gas under a suitable pressure flows through and is ignited. The flame will be tall and slender as shown in Fig. 1. By regulating the gas pressure carefully, an adjustment will be reached at which the flame will be on the verge of flaring. A very slight increase of pressure beyond this point will cause the flame to shorten and roar. When the flame is at the point of flaring, it is extremely sensitive to certain sounds, particularly those of high pitch. A shrill whistle or a hiss will cause it to flare. The rattle of a bunch of keys will produce the same result. It will respond to every tick of a watch held near it.

Tyndall says that when the gas pressure is increased beyond a certain limit, vibrations are set up in the gas jet by the friction of the gas in the orifice of the burner. These vibrations cause the flame to quiver and shorten. When the flame burns steadily, any sound to which the gas jet will respond will throw it into sympathetic vibration. Experiment has demonstrated that the seat of sensitiveness of the flame is at the base of the flame, at the orifice of the burner.

The method of producing the required gas pressure illustrated in Fig. 4 is available when gas bags or cylinders of compressed gas are not to be had. A tin cylinder of about 15 gallons capacity is provided at the top and bottom with valves. The lower valve is connected with a hydrant, and the cylinder is filled with water, while the upper valve is left open to allow of the escape of air. When the cylinder is filled with water, the supply is shut off and a tube from a gas burner is connected with the upper valve and the gas is turned on. Then the water is allowed to escape from the cylinder, thereby drawing in the gas. When the cylinder is filled with gas, the valves are closed and the lower one is again connected with the hydrant, while the upper one is connected with the pinhole burner. The valves on the cylinder are again opened and water is admitted at the rate required to produce the desired gas pressure. Only two precautions are necessary in this experiment; one is to avoid a mixture of air and gas in the cylinder by driving out all the air, the other is to avoid the straining of the cylinder by water pressure.

Another sensitive flame, which has several advantages over the one described, is shown in Fig. 5. It requires no extra gas pressure, and it is more readily controlled than the tall jet. It was discovered by Mr. Philip Barry, and the discoverer's letter to Mr. Tyndall concerning it is found in Tyndall's work on sound. In the production of this flame a pinhole burner, like that already described, is employed. Two inches above the burner is supported a piece of 32-mesh wire gauze, about 6 inches square. The gas is turned on and lit above the wire gauze. It burns in a conical flame, which is yellow at the top and blue at the base. When the gas pressure is strong, the flame roars continuously. When the gas is turned off, so as to stop the roaring altogether, the flame burns steadily and exhibits no more sensitiveness than an ordinary flame. By turning on the gas slowly and steadily, a critical point will be reached at which almost any noise will cause it to roar and become non-luminous. Any degree of sensitiveness may be attained by careful adjustment of the gas supply. A quiet room is required for this experiment. The rustle of clothes, the ticking of a clock, a whisper, a snap of the finger, the dropping of a pencil, or in fact almost any noise, will cause it to drop, become non-luminous, and roar. It dances perfect time to a tune whistled *staccato* and not too rapidly.

The flame at its base presents a large surface to the air, so that any disturbance of the air sets the flame in active vibration.

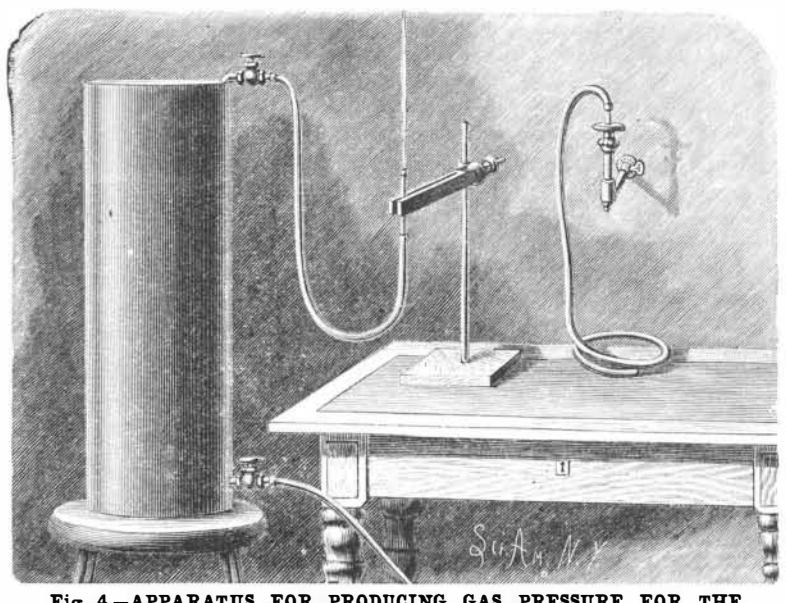


Fig. 4.—APPARATUS FOR PRODUCING GAS PRESSURE FOR THE SENSITIVE FLAME.

A CHEAP SUMMER HOUSE.

This dwelling house has been erected for a seaside residence at Long Branch, N. J., from the designs of Architect W. H. Beers, of New York City. The plans were drawn up with the view of providing commodious rooms to suit the special requirements of the owner. The plans of the first and second floors, with a condensed specification of the materials used in the construction of the house, and the approximate cost of the same, were published in the ARCHITECTS AND BUILDERS EDITION OF THE SCIENTIFIC AMERICAN of April, 1888.

A CHEAP SUMMER HOUSE.

Propagation of Parasites by Water.

The great difficulty in establishing any fixed principles in regard to the detection of micro-organisms in water received an interesting illustration in a recent article in the *Fortnightly Review*. The writer (the Hon. George N. Curzon, M. P.), in giving an account of his visit to Bokhara, dealt incidentally with the question of water supply to that famous city. Mr. Curzon found just the same state of things which prevailed when another Englishman visited Bokhara some 300 years ago. In a population which considerably exceeds 100,000, about every fifth person suffers from the presence of a worm, which is for the most part found in the leg of the individual, between the flesh and the skin. Sometimes a man is troubled with from twenty to thirty of these creatures. The worm, when extracted, is often two or three feet in length, and has the appearance of a long string of vermicelli. But the curious point is that the most minute examination of the drinking water of Bokhara under the microscope has never revealed the presence of the germ of this parasite; nor has Dr. Heyfelden—a devoted scientist, who is attached to the Russian Embassy at Bokhara—succeeded in identifying a male specimen of the creature. He is inclined to think that the female, being oviparous, pushes her way to the surface of the skin when full of young, each *reshta* when dissected being found to contain from half a million to a million embryo worms. The embryos, if occasionally dosed with a drop of water, will live for six days. Beyond all question, the presence of this repulsive worm is due to the filthy state of some of the open pools of Bokhara. The streets abound with dirty tanks of stagnant water. The water in a tank which adjoins a mosque is considered holy, and is used for drinking as well as for washing; thereby spreading the germs of all sorts of diseases, but more especially insuring the propagation of the parasite already described.

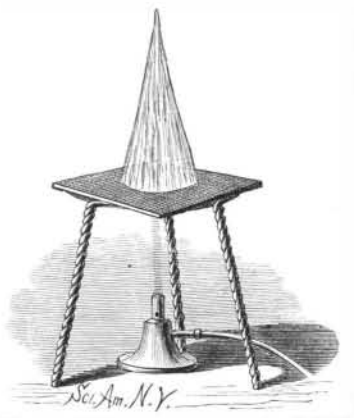


Fig. 5.—SENSITIVE FLAME WITH GAS AT ORDINARY PRESSURE.

Operation on a Lion.

The fine lion Jupiter, at the Clifton Zoological Gardens, Bristol, which is nearly 11 years old, having been cubbed in the gardens in the year 1878, was noticed lately to have a claw on the left fore paw growing into the flesh of its foot, which was gradually laming the animal. The lion was evidently in pain, and it was deemed advisable to remove the claw. The novel operation was performed recently, when a close traveling cage was introduced into the den, and placed against one of the sliding traps in the partition. The animal having been induced to enter the cage, it was removed to the floor of the building and another cage, but of different construction, composed solely of iron bars, placed endways to the door of the first cage, and the two firmly lashed together. After some little trouble the animal was got into the second cage, which was so narrow as not to admit of his turning round. Heavy inch and a half planks were then inserted between the bars, and the lion tightly wedged in. Up to this point he had submitted quietly, but on the introduction of the planks he splintered them up as easily as though they had been matchwood. At last he was firmly wedged in, and a little time was given him to cool down. A favorable opportunity for the operation occurred in a few minutes, his paw being partly through the bars. The head keeper, Blunsden, who was waiting with a pair of powerful nippers, seized the opportunity, and the offending claw was promptly removed. The operation, which was conducted by Dr. Harrison, treasurer of the gardens, was absolutely necessary, as the claw had already grown more than half an inch into the foot, and would probably have killed the animal.—*London Times.*