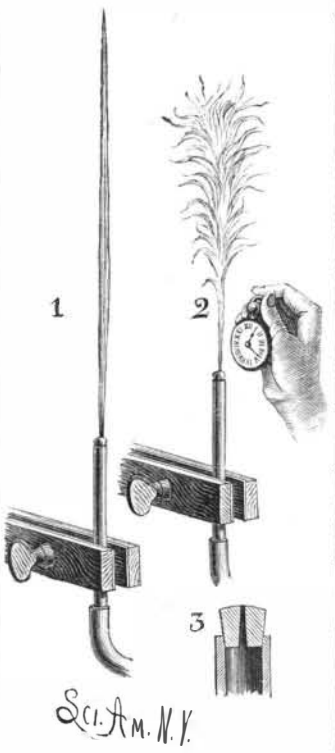
SENSITIVE FLAMES.

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.

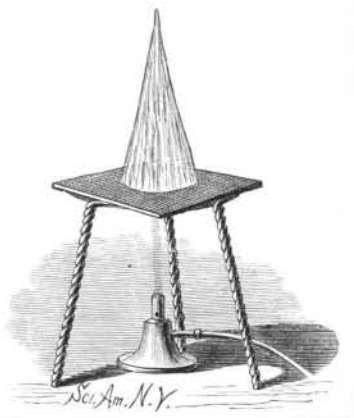


Fig. 5.—SENSITIVE FLAME WITH GAS AT ORDINARY PRESSURE.

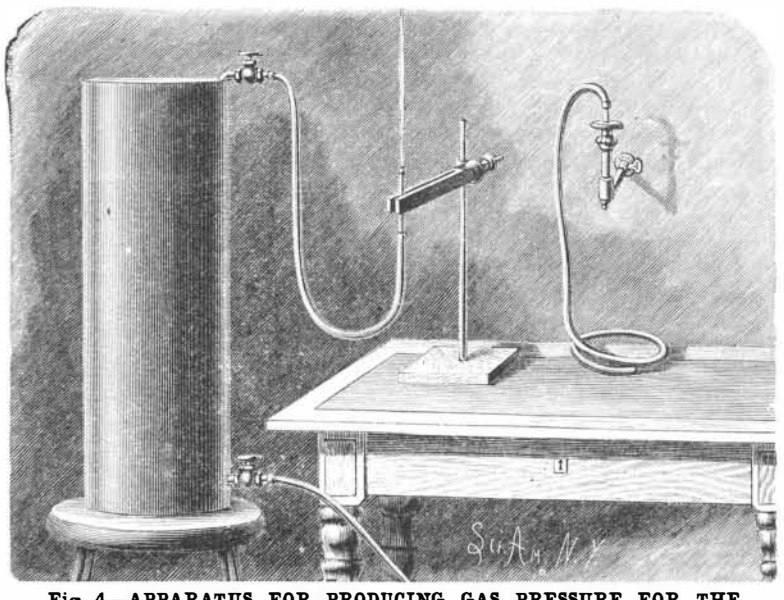


Fig. 4.—APPARATUS FOR PRODUCING GAS PRESSURE FOR THE SENSITIVE FLAME.

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.

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.*

Sending Threatening Notices.

It has long been the custom for rich men who own patents to drive smaller manufacturers out of competition by advertising constant threats of proceedings against them and those who use their wares, and there can be no doubt that in very many instances rival manufacturers have succumbed to this sort of threat, even when they have known perfectly well that the threatening party had neither right nor justice on his side; and as advertised threats of proceedings are very common in relation to photographic patents, a recent case has special interest for photographers.

The London *Photographic News* reports a flagrant case of this kind in which the court promptly granted relief—Colley *vs.* Hart—of which the following is a summary:

The defendant had for some years carried on a business for the sale of paper for a toilet requisite, and of the appliances on which the same was rolled. In October, 1884, the plaintiff, who had previously carried on a similar business of his own, sold his business to the defendant and entered into the defendant's business as manager. In 1885 a patent was granted to the plaintiff and defendant for "improvements in apparatus for unreeling, perforating, and rereeling papers into rolls for toilet and other purposes," which invention was discovered by the plaintiff, but was worked with other patents for the joint benefit of the plaintiff and defendant. In May, 1888, the business connection between the plaintiff and defendant was discontinued, and the plaintiff soon afterward commenced manufacturing and selling "toilet requisite paper" on his own account. He sold to the firms to which the defendant had been in the habit of selling. In September, 1888, the defendant issued the following circular, stating among other things, in reference to the plaintiff: "His proceedings are a distinct breach of my rights under both patent and trade mark, and I think it right to inform you I intend to commence proceedings forthwith against every person whom I find in any way dealing in any perforated toilet paper manufactured in breach of my patent rights."

In consequence of this circular a number of the plaintiff's customers declined to continue business with him until the matter was settled, and his business was practically stopped. The plaintiff moved for an interlocutory injunction on October 10, 1888, before the vacation judge, who ordered the motion to stand over till the second motion day in the following term, each party undertaking not to issue any circular. Mr. Young, a mechanical engineer, deposed that the manufacture of rolls of perforated toilet paper by the plaintiff did not in any way infringe the defendant's patent. Justice North said: "I shall restrain the defendant from issuing the particular circular and from threatening any person; and from, by means of circulars, letters, or otherwise, 'threatening any person with proceedings or liability in respect of the following papers,' whatever they are, 'manufactured by the plaintiff.'"

Motive Power at the Paris Exhibition, 1889.

The organization of the machinery and motive power department of the forthcoming exhibition is now practically completed. All the machinery will be collected in the enormous hall known as the "Palais de Machines," which covers about 46,000 square meters of ground. The greater portion of this area will be occupied by the French section, and for the foreign sections the spaces reserved are approximately: Great Britain, 4,000; Belgium, 3,500; United States, 2,700; and Switzerland, 2,200 square meters. The exhibits in the main hall will be arranged in six rows parallel with the longitudinal axis of the building. Four of these rows are to be 15 meters wide, and two 10 meters. There will be four lines of main shafting, one to each of the four large rows. Steam will be supplied by a variety of boilers, all of which will be placed in one of the courts, so that the visitor may conveniently compare the different types of steam generators. The total power of the boilers is estimated at about forty tons of feed water evaporated per hour. The following firms are among the exhibitors in the boiler department: Belleville, De Mayer, Knap (London), Babcock & Wilcox (Glasgow), Davey Paxman (Colchester), Wehyer & Richmond, Fives-Lille, Dayde & Pille, Roser, and Dulac. The distribution of steam to the various engines will be effected by underground steam pipes laid in conduits throughout the length of the main building. The size of the pipes is calculated so as to give a maximum velocity of flow of 33 ft. per second. Various boiler pressures will be used, but in the majority of cases the pressure will be between 90 lb. and 120 lb. per square inch. To provide for the condensing engines, there will be two water mains running parallel with the steam pipes, and both 2 ft. diameter—one for the cold water service bringing the water to the condensers, and the other for the return of the warm water. The administration pays the exhibitors of boilers, who supply steam for the general service, at the rate of 8,500 fr. (£340) per ton of steam delivered per hour during seven hours per day, and 180 working days. Should steam be required for a longer time than seven hours daily, the administration makes a further payment of 6 fr. for each ton of steam; and if the exhibition should be prolonged beyond the 180 days, the payment will be 5 fr. for each ton of steam supplied. Taking an average of 26 lb. of steam per h. p. hour, it will be seen from the above figures that the administration pays at the rate of about ¾d. per h. p. hour.

Of steam engines there will be shown a great variety, and the following are among the more important firms exhibiting in the motive power department: Societe d'Anzin, Davey Paxman, Societe le Phenix, Societe de fabrication des locomotives et des machines de Winterthur, Societe d'Oerlikon, Andre Berger de Thaun, Societe alsacienne de constructions mecaniques de Mulhouse, Le Creusot, Fives-Lille, Thomas Powell, Lecouteux et Garnier, Societe francaise de materiel agricole de Vierzon, Bietrix, Boulet, Wehyer et Richemond, and Cail. The so-called "machine Casse," made by the Fives-Lille Company, will be the only example of the beam engine. This will be of 600 h. p. The administration pays 40 fr. per h. p. supplied during the whole time the exhibition is open, viz., seven hours per day for 180 days, and if the power is required after this period, the payment will be ½d. per h. p. hour. The four lines of shafting will be supported on bearings fixed to a system of standards, cross girders, and longitudinal girders, the latter also serving as supports for the traveling platforms, which will run the whole length of the main hall. These will be electrically worked, and used as travelers during the instalment of the exhibits, and later on for the convenience of visitors, who will thus be carried from one end of the machinery hall to the other. The supply of feed and condensing water for a plant of boilers and engines representing about 4,000 h. p. is a matter of some importance. The total quantity of water required per day is estimated at 6,000 tons, or 850 tons per hour. The water will be pumped from the Seine and stored in elevated tanks of 166 tons capacity, the pumping plant being in duplicate, one by MM. Quilacq & Meunier (Wheelock engine), and the other by M. Thos. Powell, Rouen (Worthington steam pumps). The water will be carried to the machinery gallery by a main of 2 ft. diameter, placed along the Avenue Suffren. The exhibition opens May 5.—*Industries.*

The Law as to Party Walls.

A party wall in law is the wall dividing lands of different proprietors, used in common for the support of structures on both sides. At common law an owner who erects a wall for his own buildings which is capable of being used by an adjoining proprietor, cannot compel such proprietor, when he shall build next to it, to pay for any portion of the cost of such wall. On the other hand, the adjoining proprietor has no right to make any use of such wall without consent of the owner, and the consequence may be the erection of two walls side by side, when one would answer all purposes.

This convenience is often secured by an agreement to erect a wall for common use, one-half on each other's land, the parties to divide the expense. If only one is to build at the time, he gets a return from the other party of half what it costs him. Under such an agreement each has an easement in the land of the other while the wall stands, and this accompanies the title in sales and descent. But if the wall is destroyed by decay or accident, the easement is gone, unless such contingency is provided for by a deed.

Repairs to party walls are to be borne equally; but if one has occasion to strengthen or improve them for a more extensive building than at first contemplated, he cannot compel the other to divide the expense with him. In some States there are statutes regulating the rights in party walls, and one may undoubtedly acquire rights, by prescription, on a wall built by another, which he has long been allowed to use for the support of his own structure.—*Building News.*

New System of Propelling Vessels.

According to *Le Genie Civil*, Mr. Gouilly has just communicated to the Society of Civil Engineers a paper on a new system of propelling ships, and which consists in causing the screw to revolve in a sort of a funnel that the inventor calls a collector. This latter is formed of a cylinder, in which the screw revolves, and of a truncated cone, whose narrow end is connected with the cylinder, and whose broad end is directed toward the vessel.

The inventor explains the effects of the collector thus: The collector, applied to the small boat used for the experiments, has the effect of doubling the force of propulsion at the dead point, and of increasing the speed of the boat by one-third. This fact has been confirmed by over a thousand experiments with more than thirty different screws. A large number of experiments have given results in which the force of propulsion was much more than doubled. The collector must not be regarded as a device for improving the motion of the screw, but rather as one which itself co-operates in the propulsion.

In support of this theory, Mr. Gouilly performed before the society four conclusive experiments on a small scale, and with a boat of small size.

Benner's Prophecies.

Samuel Benner, the great financial prophet, in a communication to the *Real Estate Record and Builder's Guide*, published in this city, makes a forecast of the financial and commercial conditions of the country for the coming three years. He reasons from analogy as well as statistics compiled from close observations through many years, and supports his predictions regarding future panics and prices with a philosophic course of reasoning which cannot fail to impress all and convince many. The following is the prophecy in full:

My forecasts at present are not only for the year 1889, but also include 1890 and 1891.

It is a great desideratum to know when good times will commence, and it is also very important to know how long they will continue, and when we may expect the next panic and reaction in general business. The business men of this country do not desire a boom of short duration so much as they do a steady advance in prices and in the developments of trade—continuing for a number of years. However much they may desire this condition for future business, the records of commercial and financial history do not warrant us in making this kind of prophecy.

Since 1825 this country has not experienced a continued advance in the price of iron beyond four years. The resumption of specie payments by the government in 1879 was the occasion for the boom in business following that event. Now we have a decision by the people that protection will continue to be the policy of the government, making the occasion for the turning of the tide from depression to activity in all business. The depression in trade for 1888 was predicted thirteen years ago, and the prediction was also made at that time that the tide would turn, giving us an era of business activity during the years 1889, 1890, and 1891.

The persistence of the repetition of these trade cycles is becoming a commercial wonder, they ride triumphant over all events which have occurred during the past sixty years to oppose such regularity. These cycles have been verifying themselves through the introduction of railroads, steamboats, the electric telegraph, the suspension of specie payments in 1837 and 1857, the panic of 1873, through the Mexican war, our civil war, through all of our presidential terms since the administration of Jackson up, and up to the present time override and defeat the aims of the present administration, while using the whole machinery of the government for re-election, with the avowed policy of a low tariff, which would depress our industries.

What else can a reasonable person ask to prevent their repetition? Better times and higher prices will prevail for the next three years, and no happening or opposition can prevent them.

The outcome of the presidential election has laid a broad basis for a general recovery of confidence, an element that has been wanting for the past four years, which we have observed by the many idle furnaces, mills, and factories, and the lowest prices for nails, steel rails, and pig iron for a number of years.

The year 1889 opens with cheerful hopes. Our crops during the past year have been abundant; the prospects of an increased foreign demand for our surplus grain and provisions at advanced prices give the farmers renewed energy. We must look forward to a hot and dry summer this year, as we are not yet beyond the period for a general drought; however, with fair early crops business and prices will show considerable improvement in the spring months.

We are at the beginning of a prosperous period, and the outlook is for a decided improvement and advance in the prices of iron, railroad stocks, and in all manufactured commodities. Whenever our manufacturers are prosperous, every industrial class is prosperous.

I predict that the price of iron will advance, and the average price for the year 1889 will be higher than the average for 1888; and I also predict that there will be a wonderful advance in prices for iron, stocks, and all products and commodities in the year 1890; all business will be prosperous, it will be a year of good crops and the boom year in this period of activity.

In the beginning of the year 1891 speculation will be at its height—a great business inflation—pig iron $50 per ton in the markets of our country. I predict that there will be a panic in the year 1891. The over-trading and general inflation of business and expansion of credit and confidence will produce this result. The panic probably will be brought about by the effects of heavy rainfalls and floods, or by the collapse of some large financial business firm. This panic will be a commercial and financial revulsion, and will be followed by a long down-sweep of prices.

New Method of Preparing Hydrogen.

Mr. Stolba obtains a mixture of hydrogen and steam by heating lime water and iron filings to a high temperature. It takes but 150 grains of iron and as much lime to obtain 75 cubic inches of gas in 20 or 30 minutes. If it is desired that the hydrogen thus obtained shall be free from hydrocarburets, the presence of carbonate of lime should be avoided.—*Le Genie Civil.*