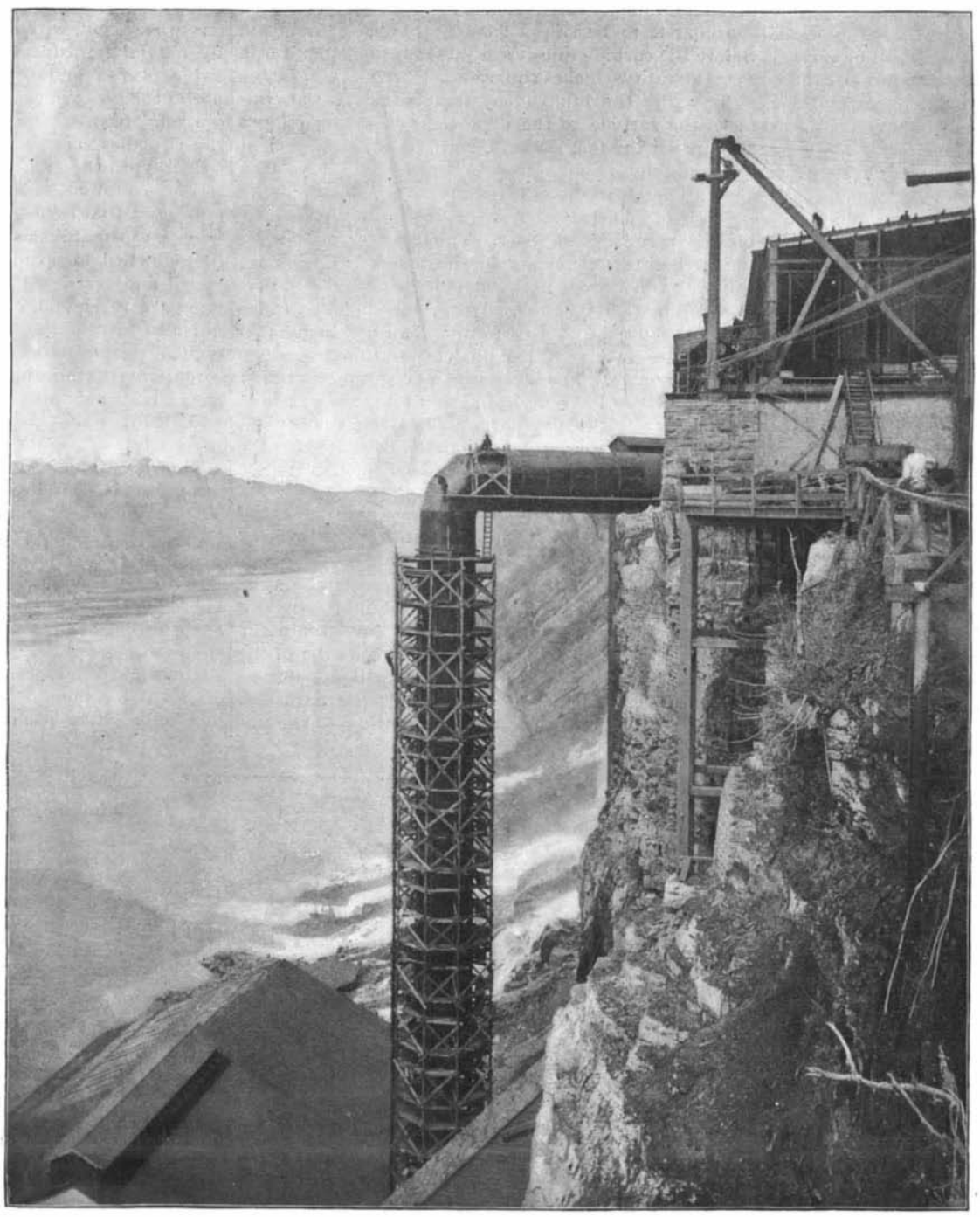
A GREAT POWER HOUSE AT NIAGARA.

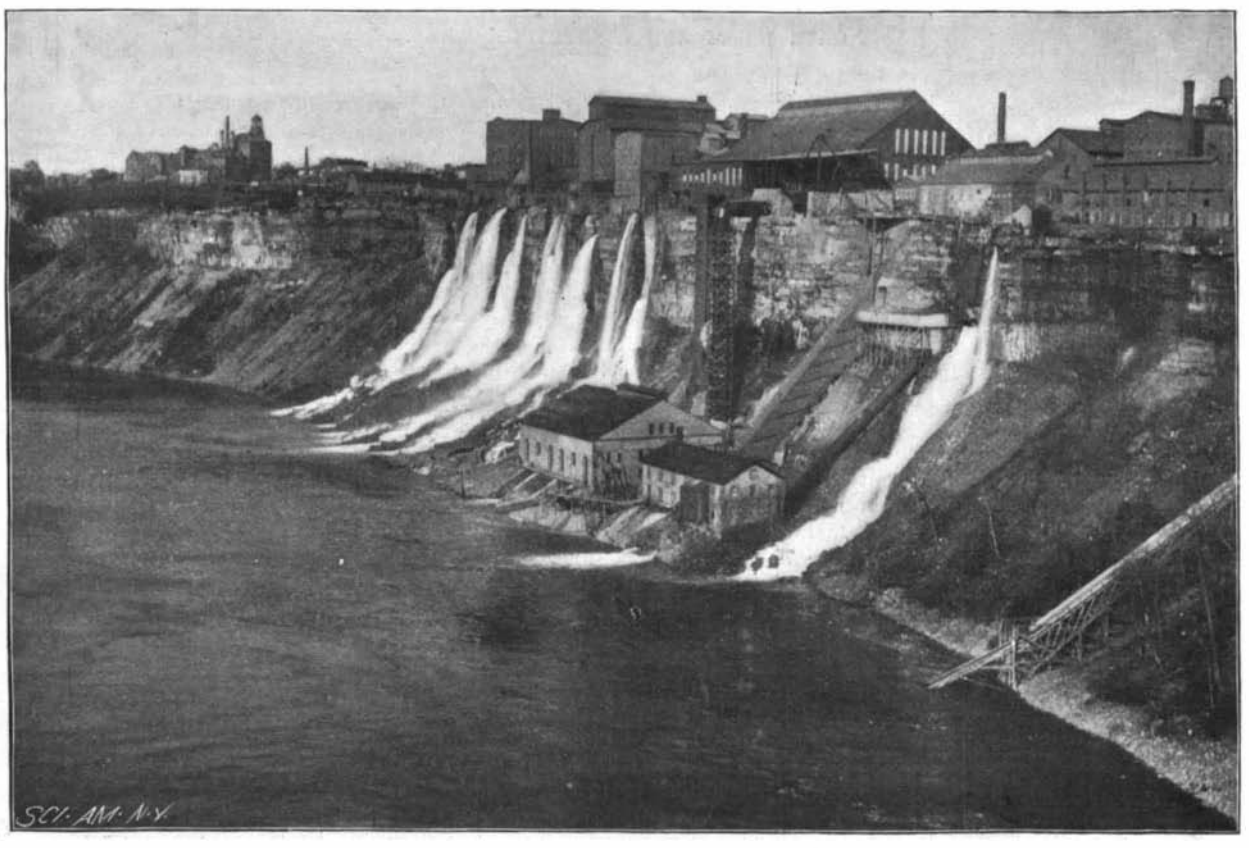
The canal of the Niagara Falls Hydraulic Power and Manufacturing Company is 4,400 feet long. For the past six years this company has expended a large amount of money in enlarging it. Their right to take water from the upper Niagara has been recognized by the State legislature to the extent that they may develop many thousand horse power. The present width of the canal at its entrance is 250 feet. In 400 feet the width narrows down to 70 feet, and at this width it continues to the basin, which is located about 300 feet back from the edge of the high bank, with which it runs parallel. The basin is about 400 feet long and 70 feet wide. The company own a right of way 100 feet wide all along the length of their canal, so that they can still further increase its width 30 feet at their desire. For 40 feet of the present width of the canal the channel is 14 feet deep, and for the remaining 30 feet it is 8 feet deep. In constructing the 14-foot channel it was run along the north side of the waterway for a portion of the length of the canal, and on the south side for the remaining distance, a course adopted, no doubt, in order that buildings standing close to the canal might be avoided until it is found necessary to still further widen the channel. The work of widening the canal is still in progress, in fact it seems to be the adopted policy of the company to proceed with this work until their waterway has attained its full width and depth. The company own their own outfit of drill boats, scows, dredges, tugs, etc., and unlike many companies, do their work by day labor instead of by contract, all being under the supervision of their chief of engineers, Wallace C. Johnson, M. Am. Soc. C. E. The excavated material is carried on scows to Port Day, at the entrance to the canal, and there deposited in huge mounds on the company's property. It is utilized in many ways, New York State through Superintendent Welch of the State Reservation, having found it most serviceable for filling purposes about the reservation, no charge being made to the State for it.

The power house at the water's edge is built of stone, much of it being quarried on the site. The walls are of the most substantial construction, while the roof is of the steel truss pattern. The original section of the building was completed in 1896, and there is installed in it four turbines made by James Leffel & Company, of Springfield, O., illustrated in the SCIENTIFIC AMERICAN for March 6, 1897, which operate eight generators, six of which supply power to the lower works of the Pittsburg Reduction Company, makers of aluminum, while the remaining two generators furnish power for the operation of the Niagara Falls and Lewiston Railway, better known, perhaps, as the "Great Gorge Route," shown in the SCIENTIFIC AMERICAN for March 28, 1896. So satisfactory was this original installation that the company immediately began the erection of an addition to the building. This addition is now completed, and the dimensions of the power house now are 100 feet by 120 feet, with ample room for still further enlargements. It is the intention of the company to place five wheels of 2,500 horse power each in the extension to the power house, and the first has been installed. It was made by R. D. Wood & Company, of Philadelphia, and in design slightly resembles the water wheels in the original section, but its construction is different. It is known as the Jonval-Geyelin improved wheel, and takes the water at the bottom through a 60-inch valve in the penstock. The water flows upward and is admitted to the guide wheels by a gate and then to the runners. From the sides project discharge pipes laterally and then downwardly, to which draught tubes 22 feet 8 inches long are attached, thus utilizing, in part, the atmospheric pressure. The heads of the casing are of cast iron, 1¾ inches thick with 2½ by 6-inch ribs at the bottom. Four 2¾-inch rods extend through the casing to stiffen it. The turbine wheels are made of bronze, and they are located in the draught tube casing, one on each side of the casing proper. The pair weigh 5,095 pounds. They are mounted upon a horizontal shaft, supported by a rigid bearing, with the flush bearings bolted to rigid bearings. The disk that forms part of the flush bearing is keyed to the shaft and adjusted by four heavy set screws, one on each end of the shaft to take up the thrust. The gate used is a ring gate. It revolves on a barrel, which is fastened to the guide wheels by bolts. A walking beam working over the main casing will operate the gate, which is connected to the beam by steel rods 2½ inches in diameter extending down through glands into the casing. Over the walking beam is an air cylinder about 36 inches high and having an inside diameter of 20½ inches. The Reynolds governor will be used. There are thirty-four buckets on the runners, having a total area of 140·25 square inches. On the guide wheel there are twenty buckets with a total area of 149·53 square inches. The wheel was installed under the supervision of E. H. Broome, representing R. D. Wood & Company.

Attached to one side of the wheel is a generator made by the General Electric Company for supplying current to the new chlorate of potash plant of the National Electrolytic Company located on the high bank above, adjoining the Cliff Paper Company's mill, and to the other side will be attached an alternating current dynamo designed to furnish current for the Buffalo and Niagara Falls Electric Light and Power Company. The first machine is in place and ready to run. It has been most carefully designed in order to enable it to cope with the severe service of electrolytic work, the process requiring practically continuous operation. The machine has 14 poles, and will make 257 revolutions per minute, giving an output of 5,000 amperes at 175 volts,



NEW PENSTOCK OF THE POWER HOUSE.



THE POWER HOUSE OF THE NIAGARA FALLS HYDRAULIC POWER AND MANUFACTURING COMPANY.

RECENT DEVELOPMENTS OF THE WATER POWER OF NIAGARA FALLS.

or a capacity of 875 kilowatts, which is nearly 1,200 horse power. It is direct connected to the water wheel. The current from this machine will be carried to the chlorate of potash works on aluminum cables, the lower part of which will be in bar form, and the upper in the form of cables well insulated. They will be the first of the kind put in practical service, but the company have great confidence in their efficiency, as the current from the original section of the station is carried to the aluminum works over aluminum cables having 500 strands, and which have been found to give good service.

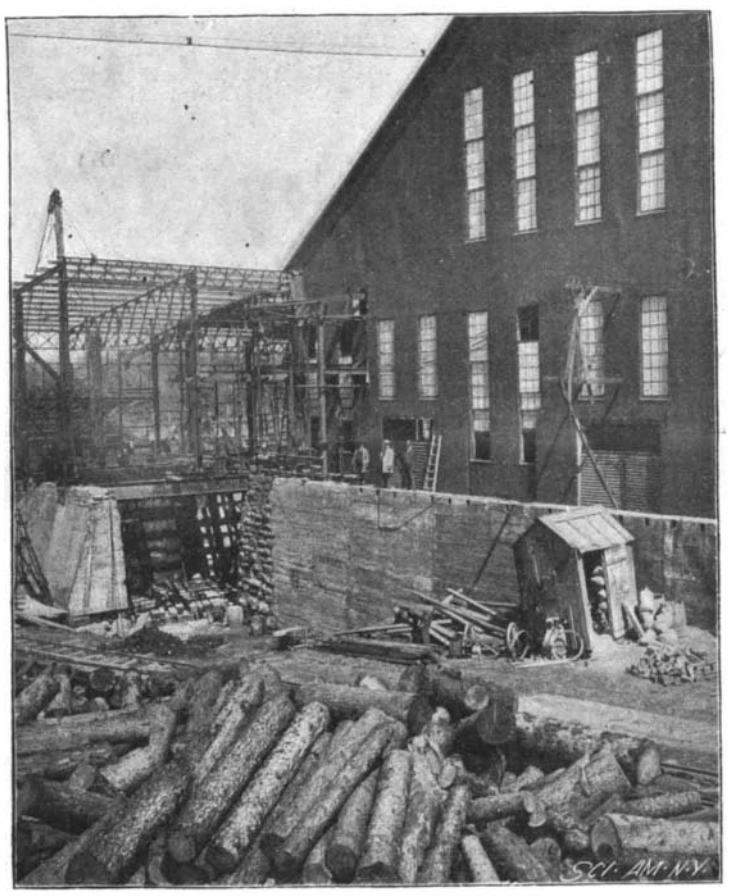
The dynamo for the Buffalo and Niagara Falls Electric Light and Power Company will be of 700 kilowatts output capacity at 2,200 volts pressure. It is to be operated at 250 revolutions per minute and at 125 cycles per second. It is being made by the Walker Company, of Cleveland, O. In connection with it there will be installed a continuous current exciter of sufficient current capacity to supply current to the fields of the dynamo to permit of its producing 1,100 kilowatts at standard voltage for a short time.

The water supply for this power station passes from the canal basin through a connecting canal about 16 feet wide, 20 feet deep and 300 feet long, to a forebay located on the edge of the high bank and running parallel to it. The length of the forebay is about 200 feet, and it is 30 feet wide by 22 feet deep.

The walls of the original section were built of stone, but in the recent extension concrete has entered largely into its construction, some of the walls being faced with stone. A second connecting canal is being built between the forebay and the canal basin, the walls being entirely of concrete. Where this canal passes beneath railroad tracks, it is to be made watertight.

The penstock of the original installation is 8 feet in diameter, the steel from which it is made varying from $\frac{5}{16}$ of an inch to $\frac{15}{16}$ in thickness. Leaving the penstock it extends horizontally 25 feet, then descends in a vertical direction 135 feet, and then at an angle of 45° to the power house. It runs under the power house floor for about 70 feet, being suspended in the tail race on iron supports. In erecting the penstock for the new installation several changes have been made. The new penstock is about 11 feet in diameter. It leaves the forebay with an elliptical bell mouth about 20 by 11 feet. It runs out horizontally supported by two steel beams for a distance of 60 feet and then drops vertically nearly 200 feet to the power house. For about 50 feet of its length under the power house floor it is 13 feet in diameter. After passing one or two wheels its diameter is reduced until it is 7 feet in diameter, beyond which point it tapers off into a cone 18 inches in diameter to form a head, finally ending in an air chamber 15 feet high by 4 feet in diameter. Owing to the size of the elbow, considerable trouble was experienced in getting it to the desired point at the falls, as the passageways between some of the mills were too low to allow its passage on cars. The steel used in its construction varies from $\frac{5}{16}$ to $1\frac{1}{8}$ inches in thickness. The new tail race under the power house floor is 22 feet wide and 30 feet deep, being slightly larger than the tail race under the original section of the building. Its construction is most substantial, of ashlar masonry. In this penstock the new penstock is supported by a series of posts and beams, made by the Variety Iron Works, of Cleveland, O., all parts of which Chief Engineer Johnson has had made adjustable by keys. The water discharged from the wheels has but a few feet to go to reach the lower river. Standing, as does the penstock, out from the cliff in column form, it presents a most imposing appearance and attracts much attention.

The gate house is located over the forebay. It is an iron frame structure covered with corrugated iron. It is a thoroughly fireproof structure, and stands in the rear of the lower works of the Pittsburg Reduction Company. Here are located the appliances for opening and closing the gates which allow the flow of water into the penstocks. Before the water passes into the penstocks it goes through racks which screen out all floating substances likely to endanger the wheels. The apparatus in the new section of this building will be very similar to that of the original installation, an improvement being made in waste gate appliances so as to avoid all trouble from floating ice.



GATE HOUSE AND CONNECTING CANAL.

Protecting Carbide against Moisture.

Carbide is packed for shipment in sealed tin cases, protected externally by wooden ones to prevent denting or piercing during handling or shipment, says The Progressive Age. As these cases cost above $15 per ton of carbide, they add materially to the price of this material. To overcome this expense and trouble, John M. Bulkley, of Detroit, has devised a method of coating the lumps of carbide with a waterproof material which prevents water or moisture from attacking the carbide, enabling it to be shipped loose, in bulk or in boxes. Before the carbide lumps are put into the generator, a space about two inches square is freed from this coating by breaking the lump or by scraping. The water attacks the carbide at the exposed spot, giving off gas and raising the temperature, the latter being sufficient to gradually remove the waterproof coating. The generation of gas is thus said to go on gradually instead of violently, as is the case when clear carbide is thrown into water. The inventor claims for the method: (1) Economy in the method of packing, shipping and storage; (2) convenience and cleanliness in handling; (3) immunity from accidents liable to occur through contact with water when not in use; (4) freedom from odor; and (5) no deterioration and waste when in storage. The idea seems a good one; certainly the end striven for is desirable and one that will tend to make acetylene popular by removing some valid objections. As to whether the method proposed is the most satisfactory, it remains to be demonstrated in practice.

The Slaughter House in Relation to Disease.

The growing danger of slaughter houses as a factor in spreading disease is at last being appreciated in its true bearings, says The Medical Record, and steps are being everywhere taken thoroughly to investigate the matter and to correct as far as possible the evils of the present system. There is much to be done, but as soon as the general public understands the nature of the perils to which it is subjected, owing to the unsanitary conditions under which slaughter houses are generally maintained, just so soon will they insist that remedial measures be taken. The most effective way to impress people with a sense of their danger is by pointing out to them that these unsanitary conditions are one of its sources, and to prove to them that, unless radical remedies be put into force, infectious diseases may increase to an almost unlimited extent.

Ch. Wardell Stiles, Ph.D., in a paper published in 1896, presents in a clear manner the subject of country slaughter houses as a factor in spreading disease. In the course of his remarks he says: "The first matter to notice in connection with this subject is that every slaughter house is, from the very nature of things, a center of disease, and naturally the poorer the condition of the premises, the more dangerous they are. These facts will appear clear if one considers what takes place at one of these houses. Even if only a few animals are slaughtered each week, the total number may amount to several hundreds during the year. Some of the animals are surely diseased. At least one of the hogs has trichinosis, and when the offal of this trichinous hog if fed to hogs which are raised upon the grounds, the latter cannot escape infection with trichinæ. But that is not all. The slaughter houses are often overrun with rats; the rats feed on the offal, and when feeding on the offal of a trichinous hog they likewise cannot escape infection with trichinæ. Rats act as direct transmitters of trichinosis to hogs." Dr. Stiles gives many more instructive details, but which we have not the space to quote. He summarizes thus: "Every slaughter house is a center of disease for the surrounding country, spreading trichinosis, echinococcus disease, gid, wireworm, and other troubles caused by animal parasites, and tuberculosis, hog cholera, swine plague and other bacterial diseases. The important factors concerned in spreading these diseases are offal feeding, drainage, rats and dogs." Two of the remedies suggested are as follows: "First, by a reduction in the number of premises on which slaughtering is allowed, on which account it is urged as all-important that there be a segregation of the slaughter houses, so that all the butchers of any given town will be compelled to do all their killing in a common, inclosed and restricted area. In abandoning slaughter houses care should be taken to destroy the rats, in order to prevent the spread of infection. Second, by regulating the factors concerned in spreading the diseases: (a) Offal feeding should be abolished; (b) drainage should be improved; (c) rats should be destroyed; and (d) dogs should be excluded from the slaughter houses."

This question of slaughter houses is attracting much attention in Europe, though chiefly in connection with tuberculosis, and some of the countries there have adopted stringent regulations controlling their management. The system in vogue in Denmark is said to be the most perfect. In Copenhagen every animal is after slaughter branded upon various parts of the carcass, and the brand is exposed in the butchers' shops to the public, which, in consequence, recognizes that the meat has been passed by the official inspectors as fit for human food. In England the question has only lately been seriously taken up. A royal commission has been appointed, members of which are at the present time visiting some of the principal towns in the kingdom for the purpose of collecting evidence. In France carcasses are seized when there are any visible signs of tuberculosis.

From abattoir statistics it is shown that in Berlin 12 per cent of the cattle slaughtered are tuberculous; in Dresden, 14·4 per cent; in Upper Silesia, 9·5 per cent; in Durham, 18·7 per cent; and in Mid-Lothian (a district in Scotland in which Edinburgh is located), 20 per cent. Of those slaughtered in London, 25 per cent are diseased, and in New York, about 20 per cent. There can be no room for doubt that the sooner the task of putting all slaughter houses into a proper sanitary state is effectively carried out, the better will it be for the public health.

Fever in Plants.

A phenomenon in wounded plants that seems to correspond exactly to what we should call fever in animals has been discovered in England by H. M. Richards. His experiments, which are described by him in The Annals of Botany, are thus epitomized in a note in Natural Science: "He finds that accompanying the increased rate of respiration is an increase in the temperature of the parts affected. A kind of fever supervenes, and as in the case of respiration, the disturbance runs a definite course, and attains its maximum some twenty-four hours after injury. It is interesting to note that the attempt to rally from an injury is accompanied by somewhat the same symptoms, increased rate of respiration and evolution of heat in plants as in animals. Owing to the nature of the case, the reaction is less obvious in the former than in the latter, and a delicate thermoelectric element was required to appreciate the rise in temperature; but, compared with the ordinary temperature of plants in relation to the surrounding medium, the rise after injury is 'as great, if not greater than in animals.' The maximum in all the plants investigated was between two and three times the ordinary excess above the surrounding air. Potatoes proved the most satisfactory objects for experiment, and it was found that in massive tissues (such as potatoes or radishes afford) the effect of injury was local, whereas in the case of leaves (e. g., onion bulbs) much greater extent of tissue was sympathetically affected."

FROM experiments on rabbits, Dr. T. Oliver concludes that risk of death from asphyxia after inhaling a mixture of air and acetylene is not so great as from a similar mixture of air and coal gas. The time taken to produce toxic effects is longer in the case of acetylene, and the symptoms are free from the nervous or respiratory excitement seen with other narcotic vapors. Provided asphyxia has not gone too far, recovery is rapid after exposure to fresh air. The subject is receiving further investigation.—British Medical Journal.

A DROP hammer just erected in the Billings & Spencer works, in Hartford Conn., is said to be the largest in the world. The drop weighs 3,000 lb. and the anvil 90,000 lb.