timbers high into the air, and afforded a most impressive demonstration of the destructive power of this, the most formidable of all methods of attack.

NOTES ON RECHARGING OXYGEN GAS TANKS.

BY RANDOLPH BOLLING.

In laboratories situated in isolated districts like ours, the expense of getting oxygen tanks recharged is considerable, the express charges from Sydney, Nova Scotia, to New York city and back, plus customs duties amounting to about $15 on a small, 15 cubic feet capacity tank. This made it highly desirable to find some means of securing a supply of oxygen at something like reasonable prices. The idea of gas bags or gasometers occurred to the writer, but as these are at best cumbersome and rather obsolete methods of storing gas, and besides none being within a thousand miles of our laboratory, it was decided that we ourselves, should recharge our tank, which had recently become exhausted. The tank was one of those pressed-steel cylinders without seams and rivets, and guaranteed to stand a pressure of 600 pounds to the square inch, and to hold 15 cubic feet. In Hempel's "Methods of Gas Analysis," translation of E. L. Dennis, a chapter is devoted to the design of a calorimeter using oxygen under very high pressure, the gas being generated in a length of iron pipe with suitable couplings. This method of Hempel's appeared to be a simple arrangement and one easy to carry out, so the writer decided to use Hempel's apparatus, substituting the oxygen tank for the calorimeter bomb.

To set up the apparatus, a heavy brass coupling was screwed to the oxygen outlet of the tank, threaded to take an iron T pipe of ½ inch inside diameter. Into one opening of the T was screwed a pressure gage reading up to 200 pounds. The generator was made of a piece of double extra-heavy steel pipe, 2 feet long by 2 inches diameter, one end closed by a steel coupling and a heavy cast-iron plug. The other end had fitted to it a suitable reducing nipple and a piece of ½-inch pipe 6 feet long, threaded at the end. The mixture for generating oxygen was prepared by heating one kilo of manganese peroxide for about six hours on a thin steel plate over four Bunsen burners, in order to burn off all organic matter. I had the commercial article on hand, and it was far from pure, containing bits of sawdust, roots, and trash very intimately mixed, and not caring to risk an explosion, I took the precaution to get rid of the organic matter. After cooling the peroxide, it was all passed through a 40-mesh sieve and then mixed with one kilo of potassium chlorate, also ground to pass a 40-mesh sieve. The chlorate and the peroxide were carefully mixed together and 400 grammes weighed off. A small portion was then heated in a test tube to test its behavior, and although it sparkled somewhat freely, possibly due to a little organic matter still retained, I judged it was safe enough for use. The generator was then all ready to be connected up to the tank; but remembering the habit of pipe fitters in lavishly using lubricating oil in threading up pipe, I decided to heat the generator pipe and the connecting pipe to a red heat for a few minutes to get rid of the oil, which if mixed with potassium chlorate would cause a bad explosion. As I expected, a good deal of smoke issued forth, showing that this precaution was necessary. After the pipe cooled, a piece of brass gauze about 6 x 10 inches was rolled up loosely and rammed down the generator. This is recommended by Hempel as a good means of removing any traces of chlorine given off, and it also acted as a sort of porous plug to prevent the chlorate peroxide mixture from falling out when the generator was being charged. The apparatus now being all ready, the generating mixture of potassium chlorate and manganese peroxide was poured into the generator and the plug tightly screwed on, the pipe tapped to settle the powder at the end, and the tank with its pressure gage attached was taken out into a nearby field, so that if anything went wrong an explosion would cause no damage. The tank was stood upright on the ground, the pipe connecting the generator screwed on, and the needle valve to the tank opened. A lot of kindling wood piled around the generator was lighted, and then the operator retired to a safe distance to await results.

After about twenty minutes the fire burned out, and everything being apparently all right, I advanced to the apparatus and closed the needle valve on the tank. The gage showed 21 pounds pressure. This experiment showed that the charging could be done in this manner with perfect safety, and that a larger weight of reagents only was needed to get our tank properly charged. The generator was then disconnected from the tank, the plug taken out, and the hard, compact mass of potassium chloride and manganese peroxide dislodged by a chisel bar. The generator was then filled with 800 grammes and the same process repeated; this time the needle of the gage showed 65 pounds. The connections were examined for leaks under this pressure, and as several bad ones showed, the connections were then unscrewed and coated with a paste made of zinc oxide and zinc chloride, which I have found an excellent material for the purpose, and the charging was begun again until the gage showed 200 pounds. It was then decided to stop further charging, as this was sufficient gas to last for some time, and as we had no gage available reading up to 600 pounds. To secure this pressure of 200 pounds it required 2 kilos of potassium chlorate (commercial), worth about $1, and 2 kilos of manganese peroxide, worth about 40 cents. The material for fittings and labor cost about $1.50, but the generator is good for hundreds of charging operations.

After one has the apparatus made, which is simple enough, a boy can charge a tank in two hours. This gas was used for carbon determinations in steel, for hastening the combustion of graphitic carbon in the determination of silicon in pig iron, and also used for burning off coke quickly in the determination of ash in coals for coke.

I find this method of charging oxygen tanks safe and economical. I have never used more than 800 grammes of the mixture for generating oxygen, not because I did not consider it safe, but on account of the size of the generator. No doubt one could calculate a charge that would fill a tank of a certain capacity up to any pressure that the fittings and connections would stand, but unless the apparatus is made of pipe known as the "extra heavy," the pressure could not be increased over 200 pounds with safety. In these notes I have given an account of my method of recharging oxygen tanks and it is hoped it may be useful to those chemists similarly situated in steel works laboratories.

LONG-DISTANCE OCEAN RACE FOR MOTOR BOATS.

CONDITIONS GOVERNING THE RACE FROM NEW YORK TO BERMUDA.

The conditions for the Long-Distance Ocean Motor Boat race from New York to Bermuda, to be held under the auspices of the Motor Boat Club of America and the Royal Bermuda Yacht Club, for the James Gordon Bennett Trophy have just been completed by the committee and are as follows:

Race.—To be from the station of the Motor Boat Club of America, on the Hudson River, New York City, to stake boat at Bermuda, placed by the Royal Bermuda Yacht Club.

Conditions.—Open to seaworthy motor boats of not less than 39 feet over all and not more than 60 feet over all. A seaworthy boat is a substantially-built, full-decked vessel, having motor power and living accommodations housed in and being equipped with all the tackles and appliances necessary to enable her to perform a long passage in open water.

Propelling Power.—Any form of internal combustion motor may be employed for propulsion purposes.

Fuel.—The committee comprehending that those entering the race have a thorough knowledge of the fuel necessary to make the passage, does not specify any quantity, but same must be sufficient to complete a distance of at least one and one-half times the distance between New York and Bermuda. No ingredient shall be used to increase the power of fuel.

Sails.—Boats must be equipped with suitable spars and rigging to carry sufficient sail to give them steerage way in a moderate breeze. This sail can be spread in any shape, but the total area of the canvas must not exceed 6 square feet for each foot of over all length. A steering sail and storm tri-sail may also be carried.

Stores and Water.—Stores and water sufficient for thirty days must be carried.

Crew.—No boat will be allowed to start with less than five men on board, one of whom shall be a practical navigator, one a practical engineer, and at least half of each crew must be amateurs. The committee earnestly recommends that no member of any crew shall be under 21 years of age, and that all members of the crew shall have had previous nautical experience.

Equipment.—A tender or life raft must be carried and a ring buoy or life jacket for each member of the crew. A full set of navigating instruments, a spare compass, sea anchor, oil bag and at least one gallon of crude petroleum or other oil, and fire extinguishers must be carried. Suitable arrangements for fitting an emergency tiller must be made. An assortment of spare parts and gear to the satisfaction of the committee must be carried.

Rating.—Will be calculated under the 1905 rules of the American Power Boat Association, except that the constant used in figuring the horse-power of the two-cycle motors shall be 850 instead of 750.

Time Allowance.—Shall be figured at 50 per cent of the American Power Boat Association time allowance table. The distance for computation for allowance to be on a basis of 650 miles.

Entries and Measurement.—Entries will be received up to twenty days before the start of the race, upon blanks which will be furnished by the Secretary of the Motor Boat Club of America, 314 Madison Avenue, New York City. All contestants must be measured by the club's measurer at least forty-eight hours before the start. An entrance fee of fifty dollars must accompany entry as a guarantee of good faith, same to be returned if boat starts.

Protests.—Protests covering the rating or eligibility of any boat must be made in writing within twenty-four hours after the finish of the race.

Inspection.—All contestants must report at the anchorage of the Motor Boat Club of America, or at such time and place as the Regatta Committee shall designate for the purpose of inspection and measurement.

Start.—The start shall be made from the station of the Motor Boat Club of America on Saturday, June 8, 1907, at 3 P. M.

The committee reserves the right to reject any entry if in their judgment the boat is unseaworthy or unsuitable for long distance racing, or is deficient in any particular. All entries will be accepted subject to inspection and approval by the regatta committee previous to the start.

The committee urges strict compliance with the letter and spirit of the conditions as above stated, and will be pleased at any time to inspect plans or boats under construction.

SCIENCE NOTES.

A remarkable collection of great archeological interest is to be disposed of in London. This comprises the extensive array of Egyptian curios collected by the well-known Egyptologist Mr. R. de Rustafjaell, and it is of a most complete description. The collection has been carefully classified and annotated and affords an informative and interesting history of this ancient country for a period of some 6,000 years, from the earliest time of the Egyptian nation 4,400 years B.C. to the present day. The pre-dynastic era is represented by an extensive array of flint implements; the dynastic period by sculpture, bronze, pottery, and fresco paintings; and the times nearer allied to the present by numerous personal ornaments, treasures, and trophies gathered from Egypt proper, the Sudan and surrounding tribes, including the famous praying board of the Mahdi found with the body of the Khalifa after the battle of Omdurman, and which is regarded with religious awe by the Dervishes, as it is popularly supposed to have been handed down to their chief through successive generations from the great Mahomed.

The technical professions now demand of their members for the higher planes of successful practise the same general educational preparation for professional study as that required by the best law and medical schools. Without entering into a discussion as to the relative merits of the educational work done by the small college and by that forming a subordinate member of the university, it is sufficient to say that this part of a well-rounded course of professional study harmonizes completely with the university system and is in fact an essential element of it. Both for technical efficiency, therefore, and for the broadest and best educational motives the technical school is bound to find its strongest development in an environment of universal study and investigation. The university has long since lost the character, if it ever properly had it, of a place where abstractions of learning, separated from the things which only give them life, are to be dispensed after the manner of instruction to men who are never to deal with the affairs of life. It has come to be an intensely practical working agent. It is effective and worthy of support only in so far as is makes itself felt in the real life of the community. If it is to be a true and real center of instruction it is imperative that it shall carry knowledge into every useful calling, governmental, corporate, or private. The time will soon come, if indeed it is not already reached, when it only can prepare men to administer and extend in a rational and moral way the great industrial activities which at the present time form the foundation of the material prosperity of the modern world.

OPENING OF THE NEW GRAND CENTRAL TEMPORARY STATION.

The opening of the temporary station, situated on the ground floor of the Grand Central Palace Building, corner of 43d Street and Lexington Avenue, in this city, occurred on Thursday, December 13.

From fifteen to sixteen additional tracks have been built in the large excavated area between 44th and 51st Streets, also between Fourth and Lexington Avenues, with a further sub-trackage of considerable dimensions. It was a novel sight to see the electric smokeless engines move about silently doing switching work. Owing to the delay in completion of signals, they will not run on the main line for a few days.

For the time being only the Harlem Division through and local trains will use the new depressed yard, which, it is thought will greatly simplify operations in the old yard. Ninety-seven trains daily will be accommodated on this division. The number of other trains run into and departing daily from the old station are one hundred and thirty-seven for the New York, New Haven & Hartford Railroad, and one hundred and twenty-six for the New York Central.