too much nitrous ether was formed and, in the case of benzoïc acid, benzoïc ether in addition. Substitution products formed in these reactions.

The benzoïc acid, treated with carbon disulphide and nitrous anhydride, *without* using alcohol as a solvent, furnished a *nitroso* compound, the barium salt of which was prepared after we had carefully driven off the unattacked benzoïc acid by persistent boiling, continued for nearly a week, replacing the water at intervals. The acid, separated from its barium salt by means of sulphuric acid, melted at 114° C. The barium salt is very sparingly soluble in alcohol, but easily in water, yielding an amber-yellow solution from which the salt crystallized in a few days. A barium determination, using 0.1949 grm. of the crystals, was made, and 0.0953 grm. barium sulphate were obtained. Theory demands 28.98 per cent. Ba for barium *nitroso*benzoate of the formula

$$(C_6H_4.\,NO.\,COO)_2.\,Ba + 2H_2O.$$

We found, according to the figures given : 28.73 per cent.

We have thus found a direct way of preparing nitroso acids, at least nitrosobenzoïc acid, which we shall now try to obtain in larger quantities, using sealed tubes, if possible, for the reaction.

The alcoholic solution of phthalic acid, when acted upon by nitrous anhydride, furnished a yellow oil which solidified after several weeks. It could not yet be used for any determination.

COLLEGE OF THE CITY OF NEW YORK,
March 7, 1890.

DETERMINATIONS OF THE FIRING POINTS OF VARIOUS EXPLOSIVES.

BY CHARLES E. MUNROE.

For this purpose an apparatus devised by Mr. Horsley,* was used which consisted of an iron stand with a ring support holding a hemispherical iron vessel in which paraffine or tin was put.

**Trans. Soc. Eng. (Eng.) 1872, page 15.*

Above this was another movable support from which a thermometer was suspended and so adjusted that its bulb was immersed in molten material in the iron vessel. A thin copper cartridge case, $\frac{5}{8}$ inch in diameter and $1\frac{5}{16}$ inches long, was suspended over the bath by means of a triangle so that the end of the case was one inch below the surface of the liquid. On beginning the experiment the material in the bath was heated to just above the melting point, the thermometer was inserted in it and a minute quantity of the explosive was placed in the bottom of the cartridge case. The temperature marked by the thermometer was noted as the *initial temperature*, the cartridge case containing the explosive was inserted in the bath and the temperature quickly raised until the explosive flashed off or exploded, when the temperature marked by the thermometer was again noted as the *firing point*. The following tables contain the results thus obtained :

GUN-COTTON.

Initial temp.	*Firing point.*	*Initial temp.*	*Firing point.*
65° C.	192° C.	129° C.	200° C.
65° "	201° "	148° "	200° "
80° "	198° "	156° "	199° "
90° "	186° "	158° "	199° "
125° "	199° "		

This was freshly made, compressed military gun-cotton and it was made with standard acids, viz., a mixture of three parts of H_2SO_4 Sp. gr. 1.845, and one part of HNO_3 Sp. gr. 1.5. One centigrm. of the material was used in each of the gun-cotton experiments.

AIR-DRIED GUN-COTTON.

Initial temp.	*Firing point.*	*Initial temp.*	*Firing point.*
100° C.	182° C.	170° C.	186° C.
115° "	179° "	170° "	187° "
170° "	185° "	170° "	183° "

This was gun-cotton similar to the above and made in the same way but it had been stored and transported in the wet state for about four years.

AIR-DRIED GUN-COTTON.

Initial temp.	*Firing point.*	*Initial temp.*	*Firing point.*
100° C.	187.5° C.	180° C.	187° C.
160° "	186.5° "	180° "	188° "
170° "	187° "	180° "	187° "
170° "	189° "		

This was from the same source as the last but had been in the air-dried condition for probably more than one year.

AIR-DRIED GUN-COTTON.

Initial temp.	*Firing point.*	*Initial temp.*	*Firing point.*
117° C.	137° C.	127° C.	139° C.
118° "	139° "	128° "	137° "
125° "	139° "	128° "	139° "

This was a freshly made, long staple military gun-cotton which had been washed as completely as possible without pulping. The acids, however, were not standard.

AIR-DRIED GUN-COTTON.

Initial temp.	*Firing point.*	*Initial temp.*	*Firing point.*
80° C.	157° C.	115° C.	154° C.
90° "	154° "	130° "	155° "
100° "	154° "	140° "	158° "
110° "	156° "	150° "	161° "

This was a recently made, compressed military gun-cotton which had been made with the same acid as the last mentioned.

DRIED GUN-COTTON.

Initial temp.	*Firing point.*	*Initial temp.*	*Firing point.*
80° C.	136° C.	109° C.	138° C.
105° "	142° "	119° "	141° "
108° "	137° "	123° "	136° "

This pulped military gun-cotton had been previously subjected to a temperature of 65.5° C. for some twenty minutes and then cooled. It had acquired a slight acid reaction.

AIR-DRIED COLLODION GUN-COTTON—LONG STAPLE, SEA ISLAND.

Initial temp.	*Firing point.*	*Initial temp.*	*Firing point.*
121° C.	186° C.	154° C.	187° C.
123° "	191° "	159° "	186° "
125° "	189° "		

This gun-cotton was about three years old and had been stored in the dry state in a closed vessel.

AIR-DRIED COLLODION GUN-COTTON—PULPED.

Initial temp.	*Firing point.*	*Initial temp.*	*Firing point.*
125° C.	197° C.	182° C.	198° C.
127° "	199° "	183° "	199° "
175° "	197° "	191° "	199° "

This was also about three years old, but had been stored wet.

AIR-DRIED COLLODION GUN-COTTON—LONG STAPLE.

Initial temp.	*Firing point.*	*Initial temp.*	*Firing point.*
82° C.	193° C.	168° C.	193° C.
163° "	194° "	174° "	190° "
165° "	195° "	176° "	195° "

This was a commercial photographic gun cotton known as "Helion" which had been stored in the dry state in a paper box, with a loose cover, for more than three years.

AIR-DRIED GUN-COTTON.

Initial temp.	*Firing point.*	*Initial temp.*	*Firing point.*
120° C.	196° C.	168° C.	194° C.
167° "	197° "	169° "	192° "
167° "	194° "	171° "	194° "

This was the residue from freshly made military gun-cotton after treatment with ether-alcohol to extract all the "soluble" gun-cotton.

AIR-DRIED GUN-COTTON.

Initial temp.	*Firing point.*	*Initial temp.*	*Firing point.*
127° C.	197° C.	184° C.	198° C.
171° "	197° "	185° "	194° "
184° "	198° "	188° "	199° "

This was obtained in the same way but from a sample of gun-cotton which had been stored some four years in the wet state.

HYDRO-NITRO-CELLULOSE.

Initial temp.	*Firing point.*	*Initial temp.*	*Firing point.*
169° C.	201° C.	195° C.	211° C.
180° "	203° "	195° "	209° "
190° "	205° "	200° "	213° "
195° "	209° "		

This was about four years old. Had been pulped and compressed and stored in the moist state.

NITRO-GLYCERINE.

Initial temp.	*Firing point.*	*Initial temp.*	*Firing point.*
150° C.	204° C.	190° C.	205° C.
180° "	203° "	190° "	205° "
185° "	204° "	195° "	205° "

This nitro-glycerine was some five years old. A single drop was taken for each experiment.

KIESELGUHR DYNAMITE, NO. 1.

Initial temp.	*Firing point.*	*Initial temp.*	*Firing point.*
96° C.	197° C.	185° C.	198° C.
180° "	198° "	190° "	199° "
185° "	198° "	190° "	200° "

This dynamite was some eight years old.

EXPLOSIVE GELATINE.

Initial temp.	*Firing point.*	*Initial temp.*	*Firing point.*
198° C.	205° C.	192° C.	203° C.
190° "	206° "	195° "	205° "
191° "	204° "	197° "	206° "
192° "	203° "	200° "	209° "

This explosive gelatine was freshly made.

EXPLOSIVE GELATINE, CAMPHORATED.

Initial temp.	*Firing point.*	*Initial temp.*	*Firing point.*
90° C.	176° C.	140° C.	174° C.
100° "	176° "	150° "	178° "
110° "	176° "	160 "	177° "
120° "	174° "	170 "	177° "
130° "	177° "	175 "	182° "

This explosive gelatine was two years old.

MERCURY FULMINATE.

Initial temp.	*Firing point.*	*Initial temp.*	*Firing point.*
130° C.	177° C.	160° C.	179° C.
140° "	177° "	167° "	175° "
155° "	179° "	170° "	181° "

This fulminate was recently made. It was wholly free from metallic mercury and was in microscopic crystals of very uniform size. The crystals were beautifully twinned and reticulated and belonged apparently to the orthorhombic system.

GUNPOWDER—SHELL.

Initial temp.	*Firing point.*	*Initial temp.*	*Firing point.*
242° C.	278° C.	263° C.	279° C.
250° "	280° "	264° "	282° "
258° "	281° "	266° "	279° "
261° "	287° "		

HILL'S PICRIC POWDER—SHELL.

Initial temp.	*Firing point.*	*Initial temp.*	*Firing point.*
262° C.	282° C.	271° C.	275° C.
269° "	276° "	271° "	283° "
269° "	273° "	275° "	278° "
270° "	279° "		

HILL'S PICRIC POWDER—MUSKET.

Initial temp.	*Firing point.*	*Initial temp.*	*Firing point.*
238° C.	282° C.	269° C.	273° C.
239° "	290° "	275° "	285° "
240° "	285° "	280° "	288° "
244° "	289° "		

These powders had been in store about ten years and they were composed of :

Ammonium picrate	42.18
Potassium nitrate	53.79
Charcoal (best alder)	3.85

FORCITE NO. 1.

Initial temp.	*Firing point.*	*Initial temp.*	*Firing point.*
60° C.	187° C.	130° C.	185° C.
80° "	184° "	145° "	190° "
90° "	185° "	170° "	188° "
100° "	190° "	180° "	190° "
110° "	191° "	190° "	200° "

ATLAS POWDER, 75%.

Initial temp.	*Firing point.*	*Initial temp.*	*Firing point.*
50° C.	175° C.	140° C.	184° C.
80° "	178° "	150° "	184° "
100° "	176° "	160° "	184° "
120° "	176° "	170° "	183° "
130° "	184° "	175° "	185° "

EMMENSITE NO. 1.

Initial temp.	*Firing point.*	*Initial temp.*	*Firing point.*
60° C.	178° C.	120° C.	170° C.
70° "	184° "	135° "	174° "
80° "	167° "	145° "	173° "
90° "	170° "	150° "	170° "
100° "	180° "	160° "	178° "

This emmensite had been stored in the magazine for some months in the original package (wooden box) in which it had been received.

EMMENSITE NO. 2.

Initial temp.	*Firing point.*	*Initial temp.*	*Firing point.*
60° C.	177° C.	130° C.	168° C.
70° "	165° "	140° "	168° "
90° "	165° "	150° "	168° "
100° "	173° "	160° "	172° "
120° "	165° "	170° "	176° "

This was received and has been stored in a tin case.

EMMENSITE NO. 5.

Initial temp.	*Firing point.*	*Initial temp.*	*Firing point.*
70° C.	205° C.	150° C.	210° C.
100° "	210° "	180° "	217° "
115° "	215° "	190° "	209° "
130° "	217° "	200° "	217° "

This was received and stored like No. 2.

THE MANUFACTURE OF COMMERCIAL HYDROGEN DIOXIDE AND ITS APPLICATIONS.

By A. Bourgougnon.

Since Bloxam, in the last edition of his "*Chemistry, Inorganic and Organic,*" (*London, 1888, p. 55*), makes the following statement: "This compound (H_2O_2) . . . . . has no very important useful application in the arts." I have deemed it wise to state what has been and is now done in this country with this article. Bloxam's remark is perfectly true as far as pure hydrogen dioxide is concerned, but is, nevertheless, misleading. Solutions of hydrogen dioxide are now manufactured in a commercial way and chiefly applied to bleaching purposes.

My first experiments in manufacturing hydrogen dioxide were conducted in 1873 under very unfavorable circumstances; the barium dioxide which could be obtained in this city was of a very inferior quality and quoted as high as $1.50 per ounce. I followed the method of preparation described by Thenard in 1818, and all I could produce was employed by hair dealers in their trade.

In 1878 I manufactured hydrogen dioxide on a commercial scale, and the following is a description of the method I adopted for the preparation of this bleaching compound:

The first step, and a very important one, is the hydration of the barium dioxide.

Into a suitable vessel, an ordinary cylindrical stone pot, about half full of water, the powdered dioxide is slowly poured, the mix-