material in our courses in quantitative and technical analysis.

It has been our experience that the work in analytical chemistry is greatly strengthened by the use of such material, but at present the time of most instructors is too occupied to devote the time necessary to make the analyses required to check the results of the students. The laboratories of many of our chemical manufacturers make such analyses as a matter of routine, and it would be a very helpful method of coöperation if they could turn over to us and to other universities laboratory samples together with their analytical data on the same. You have advocated a closer coöperation between the manufacturers and the universities and it appears to me that here is a chance for a definite service involving little extra work on the part of the works laboratory forces. Samples of one to two pounds are sufficient for a year's supply, and different samples of the same material are useful in diversifying the work of different students of the same class.

We shall be glad to pay the transportation charges. The standard samples issued by the Bureau of Standards are too expensive for general use and their range is too limited.

We shall be grateful for any aid you can give us in this matter and shall welcome any suggestions as to an efficient presentation in the proper quarters.

R. E. OESPER
Associate Professor of Analytical Chemistry
UNIVERSITY OF CINCINNATI
CINCINNATI, OHIO
October 15, 1918

INVENTION PROBLEMS

The Invention Section of the General Staff of the United States Army has submitted to the War Committee of Technical Societies a list of seven problems requiring scientific and inventive talent for solution. Problem V is of chemical interest and is reprinted here.

PYROTECHNIC SMOKE SIGNALS

It is desired to secure, if possible, a suitable chemical substitute for Red Saxony Arsenic now used for the manufacture of Yellow Smoke Signals. The characteristics of such a chemical are that it should produce the effect required, that it should be procurable in large quantities, and that it should be perfectly stable in combination with other chemicals, such as potassium chlorate. The effect desired is a rather deep orange-yellow. There is no objection to the use of dyes should these give the effect required and be procurable in large quantities at a reasonable price.

A suitable formula for a Red Smoke Signal is also a desideratum. The effect required is a pronounced and positive shade of red. As in the case of the Yellow Smoke Signal, chemicals composing it should be readily procurable and should be stable. Since, however, the requirements for this signal are considerably smaller than for the Yellow Smoke Signal a greater latitude may be allowed in selecting slightly less readily available and higher priced material for this signal.

The smoke signals outlined above are displayed from rockets, Very cartridges, Viven-Bessiere cartridges and 35 mm. cartridges. The rockets now used by our forces weigh about 2 lbs. with an approximate length of 18 in. The V-B, Very cartridges, and 35 mm. cartridges have an average length of about 6 in. with a diameter, respectively, of 2 in., 25 mm., and 35 mm. The V-B cartridges are thrown from the rifle grenade discharger, and the Very cartridges and 35 mm. cartridges from the 25 mm. signal pistols.

Should any person accredited by the Inventions Board become interested in the two pistols outlined above, this office would be very glad to give all the information in its possession.

It should be noted that Auramine has already been tried as a dye for the Yellow Smoke Signal and that Paratoner has been used in the Red Smoke Signal.

All communications regarding this matter should be addressed to Inventions Section, General Staff, Army War College, Washington, D. C., Attention of Captain Scott.

SAFETY OF TNT AS AN EXPLOSIVE

Editor of the Journal of Industrial and Engineering Chemistry:

There have been quite a few cases in this country where trinitrotoluol has exploded under conditions which would lead us to believe that it is not the safe explosive that it is ordinarily supposed to be in contradistinction to picric acid which is known to form rather unstable compounds with metals.

I would like to call attention to the fact that it is perfectly possible for trinitrotoluol to contain highly nitrated phenolic derivatives which could form salts with metals, thereby rendering the trinitrotoluol very much more subject to outside influences than if it were absolutely pure. I remember in the ordinary manufacture of nitrotoluol some ten years ago, we often isolated from our sodium carbonate wash liquors notable amounts of a red crystalline body which, at that time, I identified as a sodium salt of one of the nitrophenols.

In my reading, I recently came across a confirmation of this in *Berichte*, **18**, p. 2668, *et seq.*, in an article by Nolting and Forel on an investigation of the six isomeric xylidenes. In speaking of the formation of the nitrophenolic bodies in the nitration of xylols on page 2670, he says (free translation):

If one treats crude nitrotoluol, as obtained in the factory by nitration with mixed acid, with soda, a similar solution is obtained from which by sufficient concentration, a red and yellow mass of crystals separates. I have investigated and found that it consists of the sodium salts of the two dinitro cresols (the 1-methyl, 3,5-nitro, 4-hydroxy; and the 1-methyl, 3,5-nitro, 2-hydroxy derivatives), about $^4/_5$ being made up of the first mentioned. The dinitro cresols are formed, according to my idea, from cresol which can result during nitration by the oxidation of toluol by nitric acid or oxides of nitrogen. From the ordinarily formed 1,2,4- and 1,2,6-dinitro toluols, the above isomers cannot be formed. It might be possible that small amounts of 1,3,4,5- or 1,2,3,5-trinitrotoluols are formed which could go over, under the influence of alkali, into the corresponding dinitro cresols by replacement of the 2 or 4 nitro groups with hydroxyl, but this assumption seems to me to be improbable.

I am sending you this information for publication in the Journal as I believe it will be of considerable interest to all those manufacturing trinitrotoluol and that these facts will be certainly worth taking into consideration in the manufacture and handling of the material if they are not already clearly recognized.

RESEARCH DEPARTMENT
THE BARRETT COMPANY
NEW YORK CITY
November 7, 1918.
J. M. WEISS

WOMEN IN THE CHEMICAL INDUSTRIES OF ENGLAND

The British Ministry of Munitions has issued a circular containing a list of processes in which women are successfully employed in connection with the following industries:

Charcoal	Oil Seed, Cake Feeding	Waste Bleaching
Chemical	Paper Making	Also in the Electrical
Distilling	Rubber	Trades as Tradesmen's Laborers on
Explosives	Salt	General Laboring
Gas	Soap	Miscellaneous
Mineral Oil Refining	Tar Distilling	

NOTE—The possibility of employing female labor on some of the operations scheduled herein depends on local circumstances such as lay-out of plant, locality, type of labor available, etc.

The operations here scheduled may, in general terms, be classified as follows:

A—Simple laboring operations.

B—Operations requiring care, intelligence, and, or, resourcefulness.

C—Skilled operations.

D—Dangerous operations or operations requiring resistance to unpleasant conditions, *e. g.*, heat, dust, fumes, odor, etc.

The different sections of the chemical industry in which women are successfully employed, and the departments of each section, are as follows:

ACETONE
- B—Tankhouse: Charging tanks with mash
- B—Tankhouse: Blowing steam through vats
- B—Tankhouse: Noting temperature of fermenting mash
- A—Tankhouse: General laboring
- B—Cooking house: Charging cookers with maize meal
- A—General laboring

ALUM
- A—General laboring

ALUMINUM SULFATE
- A—General laboring

AMMONIA (concentrated) at Gas Works
- B—All operations

ANILINE SALTS
- A—General laboring

BARIUM CHLORATE
- A—Assisting in concentration and crystallization
- A—Chipping out crystals with chisel and hammer
- A—Crushing, drying, and packing

BLEACH
- B—Making up lute, making cell heads, cleaning up, oiling bearings in electrolysis house

BUTYL ALCOHOL
- B—Attending mixer
- B—Adding salt to alcohol
- A—General laboring

CAUSTIC SODA
- BD—Fusing caustic soda
- BD—Ladling fused caustic soda from melting pots and casting into stick form
- A—"Detaching," *i. e.*, breaking up caustic in cooling trays with hammer
- BD—Packing powdered caustic; labelling tins
- A—General laboring

ELECTROLYTIC PROCESSES
- A—Making up lute
- B—Making cell heads
- B—Preparing cell diaphragms
- B—Assisting in dismantling, repair, and assembly of cells
- B—Attending cells
- B—Attending switchboards
- B—Regulating voltages
- B—Recording switchboard readings

ETHER CAMPHOR
- B—Final dressing and preparing of camphor tubes

FERTILIZERS
- BD—Grinding slag in cake mill
- BD—Grinding phosphate in Kent mill
- AD—Mixing guano
- A—General laboring

IODINE
- A—Screening salt in extraction of iodine from kelp

LABORATORY
- C—Research chemists
- C—Routine testing
- B—Laboratory attendants
- C—Controlling chemical laboratory
- C—Acting as chemist-in-charge
- B—Assisting in making up culture-tubes
- C—Mounting organisms on slides and noting their condition

MAGNESIUM SULFATE
- B—Crushing magnesite
- B—Charging dissolvers
- B—Attending evaporators and crystallizing vats
- B—Whizzing

MAGNESIUM CARBONATE
- A—Discharging filter presses
- B—Packing presses for moulding

MISCELLANEOUS
- A—Helping on press for compressed sal ammoniac
- B—Operating machine for tableting ammonium chloride
- B—Control of acid circulation pumps
- B—Assembling parts in drum-making shop
- C—Control testing on plant
- A—Feeding and attending dissolvers
- B—Charging and discharging drying ovens
- A—Assisting in repacking condensers and towers (ground work only)
- B—Assisting in repairs to decomposers
- B—Controlling valves for blowing liquids from vats

NITRIC ACID
- A—Charging nitrate, attending and emptying rotary drier
- B—Weighing charges of nitrate for stills
- BD—Charging stills, luting manhole and pipe joints
- B—Running on acid
- BD—Firing still and controlling temperatures
- B—Attending and greasing acid pumps

NITRIC ACID (*concluded*)
- A—Breaking dumped niter cake, barrowing, and tipping into barge
- A—Breaking up niter cake in cooling pans
- C—Sampling and testing
- AD—Filling, sealing, and packing carboys
- BD—Working on Valentiner nitric acid still
- A—General laboring

OLEUM
- AB—Unloading pyrites, attending breaking machine
- AB—Hauling broken pyrites, weighing charges of pyrites on sulfur
- B—Charging and attending sulfur burners
- C—Sampling and testing
- AD—Grinding and calcining magnesium sulfate
- B—Impregnating granulated anhydrous magnesium sulfate with platinum chloride
- AD—Filling, sealing, and packing carboys
- A—General laboring

PHENOL
- A—Washing and stencilling drums
- A—Unloading empty drums, testing, and stacking
- A—General laboring

PHOSPHORUS
- AD—Finishing
- AD—Packing amorphous phosphorus

REFINED BICARBONATE OF SODA
- A—General laboring

REFINED SODA CRYSTALS
- A—Tipping soda ash into dissolvers
- B—Cleaning filter presses
- B—Filling, operating, and emptying centrifugal driers
- A—Grading crystals
- A—General laboring

RESPIRATORS
- B—Operating press tools for stamping out frames on plates
- B—Mechanically cleaning same
- B—Dipping in acid
- B—Nickel plating
- B—Cleaning and polishing
- B—Mounting with tapes and elastic bands
- A—Packing

SILICA
- A—Drying on open floors
- A—Crushing and bagging

SILICATE OF SODA
- A—General laboring

SODA ASH
- A—Charging vats with black ash
- A—General laboring
- B—Taking distiller temperatures

SODIUM BISULFITE
- BD—Dissolving sulfur dioxide in caustic soda
- BD—Concentrating sodium bisulfite solution

SODIUM (METALLIC)
- BD—Charging and dipping from electric furnaces

SODIUM SULFIDE
- A—Stripping and breaking from detaching beds
- A—General laboring

SULFUR
- A—Melting crude sulfur
- A—Breaking out sulfur from sulfur beds
- A—Emptying sublimers, dressing flowers of sulfur
- B—Preparing moulds for roll sulfur
- A—Removing from moulds after casting
- A—General laboring

SULFURIC ACID
- A—Feeding and attending pyrites breaking machine
- A—Sieving pyrites
- B—Weighing out charges
- B—Charging furnace (or burners)
- C—Controlling valves on de-arsenicating plant
- AD—Filling and sealing and packing carboys
- C—Sampling and testing
- BD—Coking Kessler concentrators
- BD—Helping on cascade concentrators
- BD—Operating Gaillard tower concentrators
- B—Feeding Kessler producers, including winding and wheeling material
- B—Pumping vitriol over Gay Lussac and Glover towers
- B—Working iron oxide briquette plant
- A—General laboring

TUNGSTEN
- A—Crushing, sieving, and packing

WASTE ACIDS
- BD—Operating denitration plant, all operations

ZINC DISTILLATION
- B—Making fireclay moulds and condensers