In another experiment a mixture of the alkalies was added to a mixture of linseed oil and cresol in a bottle, and the combined mixture was vigorously shaken for a short time. Then the preparation was set aside and shaken occasionally. At the end of ten days without the use of heat the sample gave a clear solution when added to nine times its volume of distilled water. Sufficient distilled water was then added to dilute the preparation to the proper strength. This method of preparation might be advantageous where ease of preparation is desired and where the preparation is not needed in a hurry.

If the linseed oil and alkalies are mixed until a creamy emulsion is formed and then the cresol is added without waiting for complete saponification to take place, the mixture formed will give a clear solution with distilled water after standing for a period of four days. It is interesting to note that the solutions prepared by the last two methods have a darker color than those prepared by the regular revised formula.

If cresol is mixed with an equal weight of any of the soft soaps prepared by the Cox Method and solution is effected, the resulting preparation will give a clear solution when mixed with distilled water. Saponated Solution of Cresol could be made by this method when a sufficient quantity of soft soap is available.

CONCLUSIONS.

1. The official soap preparations made by the cold saponification process all possess a better appearance than those prepared by the official processes.
2. Soya bean oil or corn oil form excellent products, devoid of objectionable odor and low in price.
3. The use of heat in the saponification process tends to produce darkened products.
4. Saponated Solution of Cresol may be prepared without the application of heat and the preparations made by the cold process are much lighter in color.

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THE RECOVERY OF SILVER FROM EXHAUSTED FIXING BATHS BY PRECIPITATION WITH SULFURATED POTASH.*

A PROFITABLE PROCEDURE FOR THE HOSPITAL PHARMACIST.

BY EDWARD C. WATTS.[1]

Although the recovery of silver from exhausted fixing bath solutions has been known to be practical and worthwhile for a great number of years, this procedure still seems to be overlooked or given an insufficient amount of attention by hospitals throughout the country. This should not be so, for this process is the means of effecting a considerable reduction in the operating budget. With all the agitation for more and better hospitalization at a lower cost it behooves every one connected with this vast enterprise to know how and where costs may be reduced. Hospital pharmacists because of their knowledge of Chemistry will appreciate that this reclamation is, after all, comparatively simple and inexpensive.

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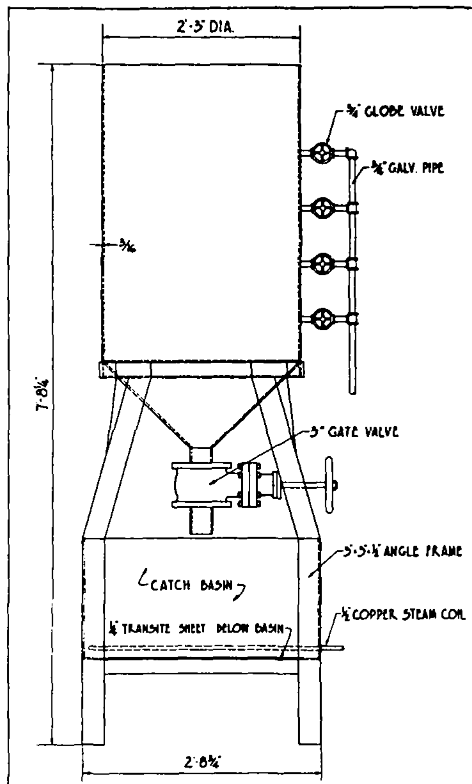
At University Hospital, prior to 1930 there had been sporadic attempts to recover silver by one process or another, but due to physical expansion and changes in personnel in this unit of the University no concerted effort was made to continue the work. By 1936 the volume of photographic solutions which were being used had so increased that it became quite obvious that a considerable amount of valuable material was being allowed to go to waste through the drains each week. About this time plans were developed for the enlargement of the Pharmaceutical Laboratory and it was decided to entrust this department with the responsibility for this recovery. In as much as this department was the place of origin for all fresh photographic solutions this decision was quite logical.

As the minimum amount of solution to be handled each week was determined to be no less than forty gallons, it was realized that some adequate and convenient piece of apparatus was necessary. A suggestion in the article by Crabtree and Ross (3) provided the basis for the design of the precipitating tank and evaporator which is shown in the diagram. This apparatus made of three quarter inch sheet metal was built to our order in the shops of the University's Buildings and Grounds Department at a cost of $150.00.



The decision to use a sulfide precipitation process was arrived at after a thorough consideration of the various methods of recovery which are recommended for silver. The amount of exhausted fixing bath to be handled in this instance was relatively large therefore a process which was prompt and economical was desirable. This we believe the sulfide precipitation method to be.

About the hospital, there are no less than five locations to which the pharmacy supplies photographic solutions and at which the exhausted fixing bath accumulates. These locations, with the amounts of solution accumulating, are as follows:

(1) X-ray department dark room, 40 to 60 gallons weekly; (2) Heart station dark room, 20 gallons monthly; (3) Photographers dark room, 5 gallons weekly; (4) Oral surgery X-ray dark room, 5 gallons weekly; (5) Photostat room, 30 gallons monthly.

It is readily seen that the greatest source of supply is the X-ray dark room. The fixing bath tanks in this location are pumped out weekly, the exhausted solution transported to the Pharmaceutical Laboratory and transferred to the precipitating tank, where the silver is thrown out of solution as silver sulfide. This reaction in alkaline solution is, for all practical purposes, quantitative. The exhausted solution from the other locations is brought in for disposal at irregular intervals whenever convenient.

SUMMARY OF INCOME AND EXPENSE, MARCH 1936–OCTOBER 1937.

Silver sludge precipitated		525 lbs.	
Metallic silver equivalent		1988.6 oz.	
Received from sale of above silver			852.13
Refining charges at 10%	85.20		
350 lbs. sulfurated potash at 22¢	77.00		
Total	$162.20		162.20
Income derived from sale of silver			$689.93

The greater portion of the solution which is received in the laboratory is already alkaline by reason of the fact that enough developing solution is carried over into the fixing bath during the processing of the films to make it so. This, however, is not always true, as this condition is dependent on the dark room technicians and the volume of work which has to be handled in each dark room. The pharmacist before attempting to carry out the precipitation should, therefore, determine by the use of litmus paper whether he is dealing with an acid or an alkaline solution. If acid, the solution should be rendered alkaline by the addition of a sufficient amount of fifty per cent sodium hydroxide solution. This is necessary to insure complete precipitation and to prevent the liberation of hydrogen sulfide. At this point the silver is precipitated as silver sulfide by the addition of a fifty per cent solution of sulfurated potash (Potassa Sulfurata U. S. P.). This we find to be more economical and easier to handle than sodium sulfide, which is more commonly recommended. For a forty gallon lot of solution from our X-ray dark room we usually find it necessary to use from 2,000 to 2,500 cubic centimeters of the fifty per cent sulfide solution to insure a complete precipitation. After testing the supernatant liquid and making certain that all the silver has been precipitated the waste liquid is then allowed to flow to the drain through one of the side valves of the precipitating tank. The particular valve to be used is determined by the level of the accumulated precipitate, the object, of course, being to remove as much supernatant liquid as possible and to retain all the precipitate. No attempt is made to wash the precipitate. It is, therefore, not finally obtained as pure silver sulfide but rather as a mixture of the sulfide and the salts of the fixing bath solution.

When a sufficient amount of the precipitate has collected and as much liquid has been disposed of through the drain as is possible, the precipitate is then dropped (with care to avoid splattering) through the gate valve into the evaporator.

Evaporation is hastened by the use of a steam coil and is allowed to proceed at will until the precipitate is thoroughly dried. Some puddling is necessary to keep the surface free of crust, which, of course, hinders the evaporation. When entirely free of moisture the silver residue is shovelled from the evaporator, packed and shipped to a refinery. Refining charges are quite reasonable and we do not feel that it would be economical to consider the reduction to metallic silver as a part of our process.

During the period from March 1936 to October 1937 there was collected five hundred and twenty-five pounds of impure silver sulfide which represented 1998.6

ounces of metallic silver. This at current market prices was valued at $852.13. Refining charges at ten per cent amounted to $85.20. This left as revenue from the sale of the silver precipitate the sum of $766.93. During the same period we used three hundred and fifty pounds of sulfurated potash. This at twenty-two cents per pound (in 100 lb. drums) cost $77.00. As the amount of alkali needed was practically insignificant the latter figure represents the total cost of chemicals needed. Deducting this amount from the net amount of cash received, we had left $689.93 as the return for our efforts. This amount we feel is decidedly worthwhile.

CONCLUSION.

The recovery of silver from exhausted fixing bath solutions by precipitation with sulfurated potash is a practical and profitable procedure, which any hospital pharmacist, who has even as little as five gallons of solution per week, to work with, should be interested in carrying out.

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STOCK CONTROL IN THE HOSPITAL PHARMACY.*

BY MARY E. BOWEN.[1]

One of the many problems with which hospital pharmacists have to deal is that of stock control. The number of items which must be available in the pharmacy at all times, though perhaps used only once in several months, runs into an amazingly large figure. The rise and fall in the demand for certain items which follows in the wake of the pharmaceutical detail men, makes this problem at times an exceedingly vexing one.

The general purchasing agent for an institution can tell from the records how many forceps, clips, yards of gauze and even how many bushels of potatoes will be needed for a given period of time and gauges his purchases accordingly. Our problem is not quite so simple.

However, the plan which we are now using aids a great deal in regulating purchases according to demand, and in keeping an adequate supply at all times to meet any ordinary circumstance. The two major points in this plan are a reserve or minimum stock, and a card file record of each purchase of each item stocked.

Each item when put in stock is given a minimum stock level which is noted on the container, or, in the case of individually packaged products such as biologicals, marked on the number of packages comprising this minimum. With most drugs and chemicals we use dispensing bottles for the routine work. These must be refilled when empty from the bulk containers and in this way the level of the bulk stock is watched more closely than it would be if each order was given out from this

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