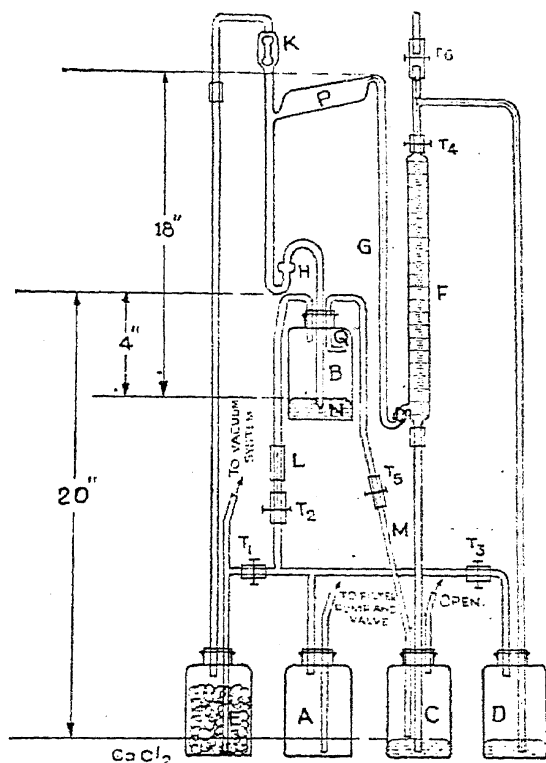


## AUTOMATIC TÖPLER PUMP

THE following description is given of an improved automatic Töpler pump which has proved successful in use. In view of the shortage of good glass stopcocks, pinchcocks have been used throughout. The bottles and tubings employed are those commonly employed in a laboratory. The glass-blowing has been reduced to a minimum. F is taken from a broken burette. In the following design the automatic system of the Töpler is worked by a filter pump.

NHKG is one piece of glass consisting of the usual Töpler P and valve K, H a bulb for trapping creepage, N, a constricted end to obviate knock. The bend at Q prevents splash of mercury and consequent creepage of air into P. A 1-1½ mm. quill tubing serves well for G and is more flexible than the usual capillary.

During the upstroke, mercury follows the gas from P via G into F and then enters C. The level in C rises, seals the bottom end of M, thereby closing B from the atmosphere. The filter pump, running continuously, is now able to evacuate B via A and the leak T<sub>2</sub>; with the fall of pressure in B, all the excess mercury that had flown into C, is lifted back to B via M. Also the mercury in P comes



AUTOMATIC TÖPLER PUMP

down, whereby E and P are connected ready for the upstroke. When all the excess mercury is lifted back to B, the bottom end of M is open, whereby air enters B to atmospheric pressure. This starts the upstroke in P and the cycle repeats. During the upstroke with the bottom end of M open, and the small leak T<sub>2</sub>, the pressure in B is substantially atmospheric.

To start the pump, T<sub>5</sub> and T<sub>6</sub> are closed, T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub> and T<sub>4</sub> are opened and the filter pump started. When exhausted to the limit T<sub>1</sub> is closed, T<sub>2</sub> is partly closed and T<sub>5</sub> then opened. The pump starts automatically. To stop the pump, the above procedure is reversed. When E and the experimental system are well evacuated, T<sub>2</sub> may be closed, for collecting larger samples of gas from the pump. T<sub>4</sub> is closed when quantitative measurements of smaller quantities of gases are necessary. F is graduated for the purpose. It may be advantageous in some cases to replace the screw pinch T<sub>4</sub>, by a suitable two-way glass tap. T<sub>6</sub> allows sampling of the gas from F. The mercury at the bottom of D serves as a valve during the intermittent action of B. T<sub>3</sub> controls the frequency of strokes. Further reduction in frequency may be effected by a fine-bore capillary tubing L in the line. The various levels marked in the diagram are somewhat critical for smooth and efficient running of the pump.

We are indebted to Dr. H. R. Ambler, Ph.D., F.R.I.C., Chief Inspector of Military Explosives, for his valuable suggestions and to the Director of Armaments for permission to publish the note.

Inspectorate of Military  
Explosives, Kirkee,  
November 15, 1944.

B. N. MITRA.  
G. SIVARAMAKRISHNAN.

ESTIMATION OF PYRIDINE AND  
AMMONIA IN A MIXTURE IN  
DILUTE SOLUTIONS

AMMONIUM salts of coal-tar origin often contain traces of pyridine. There has as yet been no entirely satisfactory method of carrying out the estimation of small quantities of pyridine in presence of ammonia. Acidimetric titration fails for want of a suitable indicator as will colorimetric methods, though sensitive, are not accurate enough. Differential electrometric titrations described below, have been found to provide an accurate method for the estimation of pyridine in ammonia.

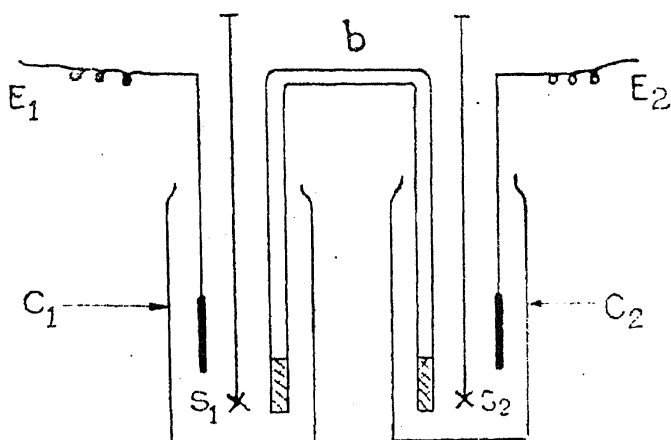
## APPARATUS

E<sub>1</sub>, E<sub>2</sub> are antimony electrodes, C<sub>1</sub>, C<sub>2</sub> titration flasks, S<sub>1</sub>, S<sub>2</sub> stirrers, b KCl-bridge with ends plugged with filter paper. Separate burettes containing N/50 acid are used for each titration flask. The stirrers, electrodes and bridge are mounted compactly on a wooden stand which also supports the two burettes. The titration flasks are inserted from below and supported by wooden blocks. E<sub>1</sub> and E<sub>2</sub> are connected through a tap key to the terminals of a millivoltmeter reading directly to 1/5 mv. The tap key is used only momentarily for taking readings which are well repeatable if polarisation is avoided.

## PROCEDURE

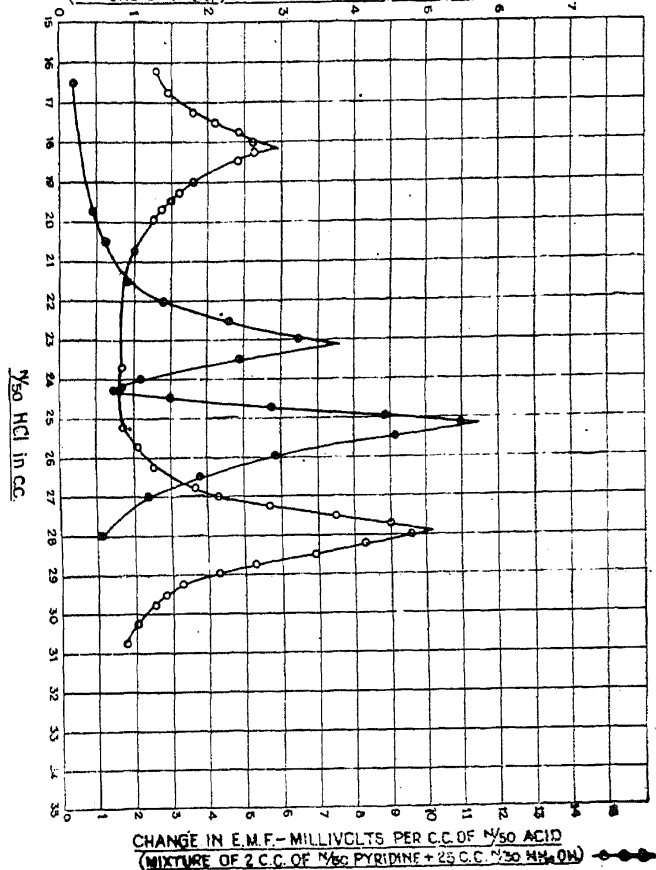
The pyridine is separated from the bulk of ammonium salts by distillation with a little alkali. Aliquot portions of the distillate are placed in C<sub>1</sub> and C<sub>2</sub>, and the stirrers started. It is generally found necessary to increase the conductivity of these dilute solutions for good working. Purest KCl or NaCl, tested to be

neutral, was found suitable and about 2-10 per cent. may be added in equal quantities to both cells. The millivoltmeter is now read.



To  $C_1$ , 1 c.c. of N/50 HCl is added, and the millivoltmeter reading again taken. To  $C_2$ , 1 c.c. of N/50 acid is added from its burette.

CHANGE IN E. M. F. - MILLIVOLTS PER C.C. OF N/50 ACID  
(MIXTURE OF 10 C.C. N/50 PYRIDINE + 25 C.C. N/50 NH<sub>4</sub>OH)



The reading is repeated. Alternate additions are made to  $C_1$  and  $C_2$ , noting the deflections for every c.c. added.

The deflections per c.c.  $\left(\frac{\partial e}{\partial v}\right)$  are plotted against  $v$ , the volume of acid added. Typical curves are shown. These curves reveal two characteristic peaks. The difference between the peaks is equal to the quantity of pyridine added. Some results obtained for known mixtures are given below.

The method is independent of arbitrary end points in titrations. Further applications of the method to inspection of weak acids and bases in textiles, paper, rubber, leather and other organic materials are under investigation.

Quantities present in the mixture in c.c. of N/50		Pyridine found in c.c. os N/50		
NH <sub>4</sub> OH	Pyridine	By the present method	By difference between end points with phenolphthalein and	
			Bromocresol green	Congo red
25.0	15.0	24.8 ± 0.2	26.0-27.2	26.2-28.4
25.0	10.0	9.8 ± 0.2	12.3-12.9	12.1-13.9
25.0	5.0	5.2 ± 0.2	7.3- 9.1	7.3- 9.5
25.0	2.0	1.1 ± 0.2	4.7- 6.2	4.8- 6.4
0.0	10.0	9.7 ± 0.2	9.5- 9.7	9.1-10.1
0.0	2.0	2.2 ± 0.2	1.9- 2.0	1.8- 2.4

Our thanks are due to Dr. H. R. Ambler, Ph.D., F.R.I.C., for his keen interest in the work and to the Director of Armaments for permission to publish it.

Inspectorate of Military Explosives, Kirkee,

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November 15, 1944.

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### LINKAGE RELATIONS OF THE *lid* GENE FOR LINTLESSNESS IN ASIATIC COTTONS

THE appearance and the inheritance of the Baroda lintless mutant was reported earlier in this *Journal* (Govande, 1944) when it was shown that this and the Viramgam lintless mutant represent independent mutations at the same locus and that the new gene designated as *lid* was distinct from and complementary to a majority of other lintless mutants so far reported. This gene has been further studied to find out its linkage relationships with other known genes. The Baroda lintless was crossed for this reason with the white pollen mutant Cocanada 45, the Burma lacinated A8 and a new multiple recessive isolated at this Station from a cross of N6 multiple recessive with Cocanada 45.

The  $F_1$  hybrids were fully dominant for the characters concerned.  $F_2$ s and  $F_3$ s were grown in the Baroda lintless  $\times$  A8 crosses and though no  $F_3$ s were grown in other two cases, backcrosses to both the parents involved were available for confirming the single factor segregations. The summary of the results is given in Table I.

That the whole of the discrepancy in each one of the cases where  $\chi^2$  is significant was due to linkage and not due to any disturbance in the single factor ratios was confirmed by partitioning  $\chi^2$  for the three degrees of freedom into its components (Fisher, 1936) when