nevertheless has a relatively restricted distribution. That the malarial parasites of birds offer an excellent and easily available substitute is not generally known.

Infected birds may be secured almost anywhere. Most small birds are probably susceptible, but of all the common types English sparrows are perhaps the most easily caught and kept in the laboratory. For methods of trapping Farmers' Bulletin No. 493[2] may be consulted. Diagnosis of malarial infection can be made either by finding the parasites in stained blood smears, or by subinoculation of blood into clean birds. When the incidence of infection is low, as seems usually to be the case, chronic infections may be often detected by dividing the birds into pairs, and then injecting at least 300 cmm of blood from each bird into the other, together with enough isotonic citrated salt solution to prevent clotting. Full directions for doing this may be found in an article by the author cited below.[3] Even the larger birds may be infected. The author has found the common starling (*Sturnus vulgaris*) and the purple grackle (*Quiscalus quiscula*) occasionally infected with a strain resembling *Plasmodium praecox,* although these birds have apparently not previously been reported as hosts.[4]

Malarial infections in birds may be used in a number of ways. Since they undergo exactly the same stages as the human malarial parasites they furnish excellent material for life-history studies, and *Plasmodium cathemerium,* with a clearly defined asexual cycle of twenty-four hours, illustrates periodicity very well. Since three of the six (or seven) species of avian malaria differ among themselves very much as the human malarias do, they may also be used to illustrate the specific differences of the latter. Descriptions of all these species are given in the papers cited below.[5, 6, 7, 8, 9]

One of the most interesting phenomena in all parasitology is the formation of microgametes from microgametocytes, and this can be very readily observed if a drop of heavily infected blood is mixed with a little physiological saline solution and watched for fifteen or twenty minutes under the oil immersion.

For the study of the course and pathology of a malarial infection canaries are very suitable, since they are virtually always free from such infection to begin with. The effect of quinine and plasmochin treatment is also interesting to follow, and the protection which a chronic infection confers against superinfection is easily demonstrated. In all these respects malarial infection in birds closely resembles that in man.

There is also the further advantage that study of the avian malarias might interest more students in using them as research material, if it could be widely carried out, and that as a result our knowledge of both bird and human malaria might be increased.

REGINALD D. MANWELL
SYRACUSE UNIVERSITY

DEVICE FOR CONSTANT FLOW OF LIQUIDS

RECENTLY I found it necessary to evolve some sort of mechanism which would give me a constant flow of liquid from a container.

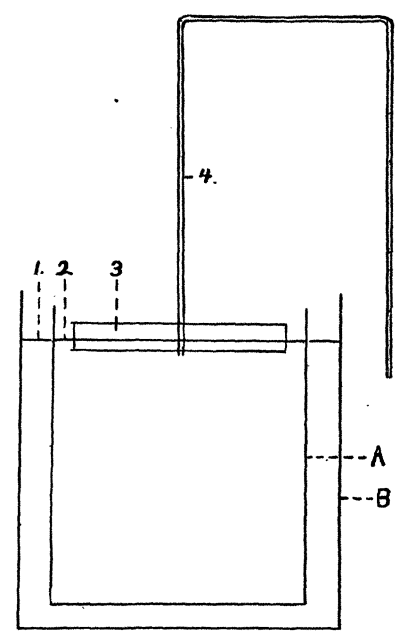

FIG. 1. A, container; B, container; 1, surface of water in container (B); 2, surface of water in container (A); 3, float; 4, siphon.

[2] Ned Dearborn, "The English Sparrow as a Pest," Farmers' Bulletin No. 493, Government Printing Office, 1927.

[3] Reginald D. Manwell, "Experiments in Bird Malaria," Chap. 37, "Problems and Methods of Research in Protozoology" (edited by Hegner and Andrews), Macmillan, 1930.

[4] C. M. Wenyon, "Protozoology," Wm. Wood & Co., 1926.

[5] Ed. et Et. Sergent and A. Catanei, "Sur un parasite nouveau du paludisme des oiseaux," *Comptes rendus de l'Acad. des Sci.,* 186: 809–810, 1928.

[6] Clay G. Huff, "*Plasmodium elongatum,* n. sp., an Avian Malarial Organism with an Elongate Gametocyte," *Amer. Jour. Hyg.,* 11: 385–391, 1930.

[7] W. Kikuth, "Immunobiologische und chemotherapeutische Studien an verschiedenen Stämmen von Vogelmalaria," *Zentralbl. f. Bakt.,* 121: 401–409, 1931.

[8] F. G. Novy and W. J. MacNeal, "Trypanosomes and Bird Malaria," *Amer. Med.,* 8: 932–934, 1904.

[9] Paul F. Russell, "Avian Malaria Studies, *V. Plasmodium capistrani,* n. sp., an Avian Malarial Parasite of the Philippines," *Phil. Jour. Sci.,* 48: 269–287, 1932.

The mechanism naturally had to get around the fact that as liquid flows from a container the head is diminished and consequently the rate of flow decreased.

The use of a float valve in keeping a constant head was not satisfactory, so the siphon principle was employed and later modified to the form described as follows:

(1) Secure a container (A) of fairly light material which is large enough to hold the liquid that is being used.

(2) Fashion some sort of float which will rest on the surface of the liquid in the container. It must be a flat float which will not turn over.

(3) Run the short arm of a U-shaped siphon tube through the center of the float so that one end of the tube is submerged and the other (lower) end is outside the container. The height of the U must be great enough so that as the liquid is siphoned off and the float sinks the tube will not strike the lip of the container.

(4) The arrangement above will give a fairly even flow, providing the depth of the liquid is not great, but in order to give an unvarying flow the container of liquid (A) must be floated in a second container (B), so that as the liquid is siphoned from (A) it decreases the weight of (A) and causes it to rise in the water in container (B). Thus the two ends of the siphon are kept at exactly the same level throughout the process.

The apparatus has been described very roughly, and it is necessary to watch the balance and points of contact so that the rising and dropping of the floating bodies is not hindered.

J. H. WALES

STANFORD UNIVERSITY

SPECIAL ARTICLES

LATENT PSITTACOSIS AND SALMONELLA PSITTACOSIS INFECTION IN SOUTH AMERICAN PARROTLETS AND CONURES[1]

DURING the month of May, 1933, the United States Quarantine Station at Angel Island received a shipment of tropical birds for the customary isolation of 2 weeks. The parrotlets, paroquets and conures had been caught in 1932 during the month of October 300 miles south from Barranquilla. They were held at the establishment of a dealer at Magangue and then at Port Colombia, from where they were shipped on April 20, 1933. Through the courtesy of Dr. H. A. Spencer, medical officer in charge of the United States Public Health Quarantine Station, 52 of the psittacine birds, which died during the quarantine period from May 11 to June 13, were sent to the laboratory for study. Complete autopsies, cultural examinations and mouse inoculations with the organ suspensions were made on every bird. Since the spleens and livers of 2 spectacled parrotlets produced in mice sterile lesions suggestive of psittacosis with positive findings of L. C. L. bodies, the State Department of Public Health arranged with the United States Public

[1] From the George Williams Hooper Foundation, University of California, San Francisco, California.

TABLE I

	No.	Sex		Splenic tumor and liver necroses	Psittacosis virus	Salmonella "aertryck"
		M.	F.			
Tovi paroquet, *Brotogeris jugularis** (Müller)	39	15	24	4	—	4
Spectacled parrotlet, *Psittacula conspicillata* (Lafresnaye)	37	26	11	4	2	4
Spengel parrotlet, *Psittacula spengeli* (Hartlaub)	16	9	7	3	4 = (25 per cent.)	—
Petz paroquet or conure, *Eupsittula canicularis* (Linnaeus)	29	12	17	15	—	5
Brown-throated paroquet, *Eupsittula pertinax aeruginosus* (Linnaeus)	11	6	5	3	2	3
Totals	132	68	64	29	8 = 6 per cent.	16 = 12 per cent.

* Determined by Professor J. Grinnell from Ridgway's "Birds of North and Middle America," Part VII, 1916.