AN IMPROVED CAGE DESIGN FOR EXPERIMENTATION WITH PASSERIFORM BIRDS

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One of the essential laboratory items needed for experimental studies of the bioenergetics of birds in captivity is a properly designed cage. Cages used at the University of Illinois were first constructed entirely of hardware cloth (Kendeigh, 1949), but many improvements were made in later years. In the author's nutritional studies with the Tree Sparrow (*Spizella arborea*), begun in 1962, several new modifications were incorporated in the cages in the interest of decreasing food loss, lessening the chance for birds to escape, and increasing the efficiency of separation of feed from accumulated feces. Since there are frequent inquiries concerning these cages, it seemed desirable to publish a set of directions for their construction.

DETAILS OF CONSTRUCTION AND DISCUSSION

The cage proper measures 31 × 16 × 31 cm, and is built with galvanized sheet-metal walls which extend above the level of the perch (Fig. 1). The upper two inches of the walls and the top of the cage are of one-half inch mesh welded hardware cloth which permits adequate light entry and air circulation. The vertically sliding door reduces chances of escape whenever the birds are handled. The cage, as illustrated, is equipped for recording of bird activity. The switch assembly (S in Fig. 1) on top of the cage, similar to that used on the older-type cages, consists of an adjustable spring-assisted microswitch that supports a hooked center rod to which the perch and moveable cage bottom are attached. The switch closes whenever the bird jumps onto or off of the perch or cage bottom. The moveable cage bottom is suspended approximately one inch above the excrement-pan floor.

The cage is easily modified to a non-activity type. For that purpose, a one-inch mesh screen bottom (less center rod) is supported by four one-eighth inch bolts arranged two on a side about one inch above the floor pan. A centrally positioned one-half inch wooden dowel perch, with ends tooled to fit one-quarter inch holes in the cage sides replaces the rod perch. A handle formed from number nine galvanized wire and attached to the top of the cage aids in the cleaning operations. The simple conversion feature of this type of cage reduces the number of cages necessary for the conduct of studies alternately considering or ignoring activity. Detailed construction plans for the cage and its attachments are shown in Figure 2. The floor pan (Fig. 1) consists of a simple one-half inch deep pan with rolled edges except at the open end which extends about two inches in front of the cage to collect any accidentally spilled feed.

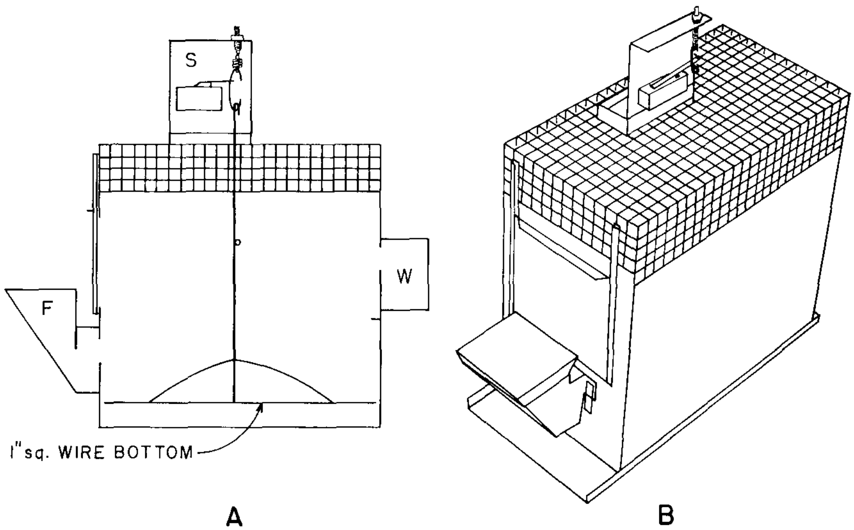

FIG. 1. A: Cut-away view from the right side of experimental cage showing relative positions of feeder (F) and water cup (W), and perch-bottom unit hooked to activity switch assembly (S). B: General view of cage as placed on the excrement pan, showing feeder attachment and vertically sliding door.

The placement of the food source outside the cage prevents, to a large extent, scattering of feed inside the cage. The birds quickly learn to reach through the one-inch diameter hole to feed, being encouraged to do so by purposeful displacement of some feed through the hole onto the cage floor when they are first introduced. Part F_3 (Fig. 2 and Fig. 1A), in addition to forming the front of the feeder, includes an apron portion which serves partially to separate the feeding area and storage area, thus preventing gross scattering of feed. This also serves to encourage the birds to eat most of the feed in the feeding area before fresh unpicked feed falls from the storage area. When food is offered in the form of finely ground mash, it is advisable to release any compressed mash by passing a spatula or similar tool down through the storage area at least once a day so that the feeding area constantly contains food. The portion of the food hopper immediately outside the feeder hole is covered by a fitted lucite strip so that the feeding area is well lighted.

In actual use, the cage is usually cleaned at three-day intervals. After cleaning, a labeled, pre-weighed sheet of aluminum foil (both Reynolds Wrap and Kaiser Foil in 12-inch widths have been used at one time or another) is placed under the cage proper so that the floor pan is lined. At the end of the three-day interval, the accumulated excreta is separated from any feed

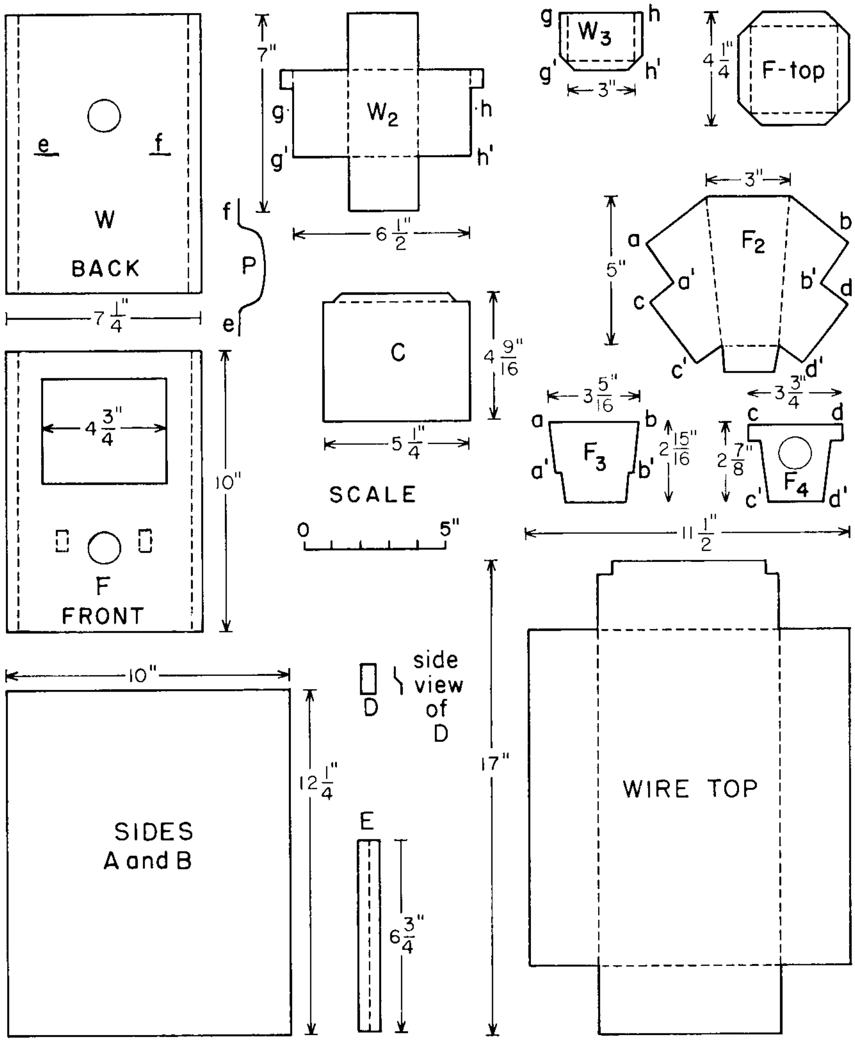

Fig. 2. Scale drawing of composite parts of experimental cage. W—Back side of cage with watering hole over which waterer (W_2) fastens on clips D. Points e and f are soldered points of attachment for perch (P). W_3 is cage side of waterer. F—Front side of cage with feeding hole and door opening. Feeder (F_2) has a top front (F_3) which attaches at common letter points (a to a, b to b, etc.) and a bottom front (F_4) which provides extensions (c and d) to hold feeder to the cage by hooking on clips D. Sliding door (C) runs in channels formed by bending strip E double. A & B—identical side pieces for cage. Wire Top—piece cut from ½ inch mesh hardware cloth; to be soldered to main cage frame formed by soldering W, F, A, and B. Dotted lines represent break-points for 90-degree bends except for piece E which requires a bend of about 170 degrees.

(finely ground) which may have been spilled, with the aid of a draftsman's brush and a one-sixteenth inch wire screen sieve. The excreta is gathered into the bottom foil, which is then folded loosely (to prevent loss) and oven-dried.

Other investigators that have used the cage have not employed the foil liner, simply allowing excreta to accumulate on the bottom pan. However, the use of foil eliminates the necessity of scraping, and thus fragmenting the excrement. When foil is used, granules of feed readily tap free from the polished surface at the time of cage-cleaning whereas scraping from the excrement pan requires drying of spilled (and uneaten) feed and excrement together, followed by screening and mechanical agitation to dislodge food particles. The latter process would seem to encourage further fragmentation of the excrement with a resultant loss of part of the excrement quantity through the sieve. Where metabolism or bioenergetics studies are in progress, this loss of raw material may result in underestimation of excrement quantity produced, and overestimation of feed not eaten.

SUMMARY

Several new ideas were incorporated in the design of an experimental cage for passeriform birds. Detailed construction plans are included and some of the design features are discussed. Suggestions for routine application procedures of the cage are offered including the use of aluminum foil as a disposable medium to aid in quantitative excrement collection and handling.

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