

quadrangle. The posts are 4 inches square and 30 feet in length, set into the ground 4 feet, and exactly 7 feet apart. Four rows of girders, 2 by 4 inches by 22 and 4 inches are halved in two and bolted to the inside of these posts, the first row 5 feet from the ground, then three rows at intervals of 7 feet until the top is reached. The upper 3 lines of girders are continued from each side of each inside post, forming a brace on each side of each post at intervals of 7 feet, and forming the bearings for the wire-covered frames which cover the top of the cage. The space from the ground to the first girder, 5 feet, is covered with matched lumber nailed to the outside of the posts, leaving a smooth surface on both sides. The upper 21 feet on the sides and the top of the cage is inclosed by wire-covered frames 7 feet square, bolted to the girders on the sides, and securely fastened with screws to the frame-work at the top.

The height of the frame is thus adjustable at 25 feet, 19 feet or 12 feet from the ground by simply lowering the screen frames forming the top, and the upper row (or two upper rows as the case may be) forming the sides of the inclosure, the purpose being not only to determine whether queens or drones would mate in this cage at full size, but also how small an inclosure would be sufficiently large to give suitable freedom and range of flight.

These wire-covered frames are framed like a two-light window-sash, with a mullion in the centre, on which the two breadths of wire-cloth meet. Strips of wood secure the edges of the cloth, and cover all joints at the sides of the frames. With the lower board of the siding settled into the ground, and earth filled against the inside, and the door tight-fitting, the cage is bee-tight. I used drab-colored wire-cloth, which obstructs the light but very slightly. A shelf is fitted against the four sides of the cage on the inside one foot from the ground, and alighting-boards directly opposite on the outside. Upon this shelf the hives are placed.

Each hive has an exit cut in either end, and an exit is cut through the wall of the cage registering with the outer exit of each hive, over which, on the outside of the wall, a piece of queen-excluding zinc is nailed. These hives are painted strikingly distinguishing colors, as red, white, blue, green, yellow and black, and a space opposite each of the alighting boards, and a corresponding space on the outside of the wall of the cage are painted in corresponding colors. The colors are repeated in the order named, which separates the hives of the same color a sufficient distance to prevent confusion, and the bees and queens readily distinguish their own

hive by means of color as readily as by location. If the inner exit be left closed for a day or two after a colony is placed in a cage, the worker-bees readily learn to enter their own hive upon returning from the fields. I found that the queens had no difficulty on returning to their own hives after taking flight in the cage. To test that fact I frequently opened a number of hives in succession, and placing the queens upon the palm of my hand, tossed them high in the air, when they would take wing and fly away.

Upon re-opening the hives a few minutes later they would be found upon the combs. The queens and drones appeared to fly and disport themselves with as much freedom and regularity in the cage as they did in the apiary outside. The virgin queens were introduced from the nursery by various methods. Some were hatched in colonies in the cage from cells matured in strong queenless colonies, and some from cells built under the swarming impulse, which this season could be produced by artificial means only. Mature drones were selected from the hives in the apiary, and also from those returning from their excursions and liberated in the cage, and sealed drone-brood was removed from the hives in the apiary and hatched in strong colonies built up in large hives in the cage, and these drones all flew with freedom and regularity.

A few times I observed a queen embrace a drone and fly all about the cage with entire freedom, and then, the embrace being broken, each flew away in different directions, the queens returning to their hives, and the drones at once rejoined their fellows in the upper part of the cage. It is needless to add that in such cases no accomplishment had taken place.

The results realized from this line of experimental work have been so meager, and the circumstances attending the experiments so exceptionally unfavorable that it is not easy to form an estimate of their value, or determine their significance. Of the many scores of trials made, but six were successful; but six queens were fecundated in the fertilizing cage. However, as the improvement of the bee to the highest attainable excellence outranks all other considerations in practical importance and scientific interest, the methods and results of any intelligently-conducted experiments having this end in view, are well worth placing on record. Besides, future trials may receive direction from a multitude of failures, and the trying experience of the past season is not without compensating features, for even the little gains we make in positive knowledge, although apparently trifling in themselves, have often significant meaning and brood bearing on questions of great value and importance.