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UNITED STATES PATENT OFFICE.

FRANK E. DENNY, OF LOS ANGELES, CALIFORNIA, DEDICATED, BY MESNE ASSIGNMENTS, TO THE CITIZENS OF THE UNITED STATES.

METHOD OF COLORING CITROUS FRUITS.

No Drawing. Application filed March 1, 1923. Serial No. 622,156.

(FILED UNDER THE ACT OF MARCH 3, 1883, 22 STAT. L., 625.)

To all whom it may concern:

Be it known that I, FRANK E. DENNY, a citizen of the United States of America, and an employee of the United States Department of Agriculture, residing at Los Angeles, California, have invented a new and useful Method of Coloring Citrous Fruits.

This application is made under the act of March 3, 1883, chapter 143 (22 Stat. 625) and the invention herein described and claimed may be used by the Government of the United States or any of its officers or employees in the prosecution of work for the Government, or by any person in the United States, without payment to me of any royalty thereon.

The process of curing lemons as heretofore carried out has been substantially as follows: The washed and sorted fruit is placed in packing boxes containing from 50 to 60 lbs. of fruit each. These are stacked in rooms which contain approximately a carload of fruit. Blue flame kerosene stoves are installed either in the room, in the basement beneath the room or in an outside stove house. These stove houses, or generating rooms as they are often called, contain from 6 to 30 stoves. The gases generated in this room are conveyed through pipes into the rooms where the fruit is stored. The humidity in each case is controlled by water placed upon the stoves, whether they are in the generating room, in the basement or in the storage room. Storage rooms are usually so constructed as to be easily ventilated. In this way fruit has been cured in from 5 to 15 days, depending upon the original color of the fruit, the temperature of the room and apparently, to some extent, upon the number of burners operated.

My investigations have led, through the analyses of these combustion gases, to the selection of the gas known as ethylene (C_2H_4) as being mainly responsible for the coloring of the fruit. I have found that carbon monoxide, acetylene and possibly some other constituents, including butadiene, also have the power of coloring citrous fruits. Ethylene, however, brings about the change when used in concentration as low as one part in a million, and for practical purposes, the maximum concentration permissible seems to be one part in five thousand. The fact that ethylene is a cheap commercial product which can be readily secured in cylinders has also led to its selection as the best means for accomplishing the result.

In the practical operation of my process, ethylene gas from a cylinder is liberated into the room by means of a pipe leading from the cylinder through the walls of the room, or the gas cylinder is carried into the room, the cubic content of which has been ascertained, and a sufficient amount of gas liberated to bring the content in the room to the desired amount. It is preferred to renew the gas from two to four times in twenty-four hours, and to thoroughly ventilate the rooms at least once each day. Where necessary, humidity is maintained by the use of atomizers. It is found that the coloring of the fruit will take place slowly at temperatures as low as 55° F., and develops more rapidly as the temperature is increased. So far as the experiments go, a temperature of 65 to 70° F. seems most favorable for practical work, and a temperature of 80 to 85° F. seems to be the maximum for producing the best results. In experiments already carried out, the practice just described has colored and cured lemons in from 4 to 7 days. Experts passing upon the quality of the fruit could not distinguish it from fruit of the same lots which had been cured by the older method.

The substitution of this new gas method for the older method using stoves will greatly reduce the fire risk, do away with expensive installations of stoves and generating rooms, and will reduce the labor and constant supervision necessary during the operation. It also permits of a standardized procedure by which uniform results can be obtained, a feature which was entirely lacking under the old method.

While it is not believed that any other of the constituents of combustion gases are as efficient as ethylene, carbon monoxide and acetylene may be used in the same manner as described above for the use of ethylene.

I claim:

A new and useful method of coloring citrous fruits, consisting in bringing ethylene gas into contact with green citrous fruits, and maintaining that contact at a temperature as low as 55° F. and below 85° F.

FRANK E. DENNY.