adapted to this apparatus in order to keep the rate of aspiration uniform and of a known velocity. The flow-meter was connected with the aspirator at the point "D."

Reagents Used

Standard Hydrochloric Acid Solution..... 0.2 N.
Standard Barium Hydroxide Solution..... 0.2 N.
Phenolphthalein as Indicator.

In order to give an idea of the suitability of this apparatus for respiration studies the following data, which were obtained as the result of five consecutive determinations, each of one hour duration, are presented.

Type of sample	Determination	No. of apples	Wt. of sample	Storage temp.	Mg. CO_2 per kilo. hour
Grimes Golden apples	1	70	8659 gm.	30° F.	3.31
"	2	"	"	"	3.65
"	3	"	"	"	3.62
"	4	"	"	"	3.62
"	5	"	"	"	3.62

SUMMARY

A respiration chamber of low original cost was used, which because of its large size was adapted to handling samples of considerable bulk or quantity. The most important feature of the chamber was its wide mouth, which permitted easy insertion and removal of samples.

With the double system of connections, either total or intermittent determinations were made with only momentary stoppage of the air-stream.

The flow-meter proved very satisfactory in maintaining a known and uniform rate of aeration.

The apparatus described was admirably adapted to the determination of carbon dioxide as a measure of respiration on apples, tomatoes and cut flowers.

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APPLE RUST ON HOST TISSUE IN CULTURE DISHES

YOUNG York Imperial apple leaves were removed from the tree, washed, treated with 1–1,000 bichloride of mercury for about two minutes, rinsed in sterile water and inoculated with sporidia of *Gymnosporangium juniperi virginianae*. Inoculation was accomplished by placing a large culture dish containing several leaves under a bell-jar in which was suspended a rust gall discharging sporidia. The leaves were allowed to remain there for about one to two minutes and were then placed in culture dishes containing modified Pfeffer's solution plus .5 per cent. glucose. The cultures were placed in a well-lighted room. Such inoculated leaves developed visible rust spots and pycnia in approximately the same period of time which would have been required if infection had taken place in leaves on the tree. The leaves were frequently transferred to fresh nutrient solution. Cutting away large portions of the leaf did not interfere with development of the disease in the remaining portions. Some specimens were maintained in culture for nearly five months without evidence of deterioration. Pycnospores were produced in great abundance, and one apparently normal aecium was formed, but it was accidentally destroyed without being examined to determine if spores were present. A special type of culture dish has been devised which should enable us to carry the cultures free from contamination for a longer period of time.

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SPECIAL ARTICLES

NORMAL MUSHROOMS FROM ARTIFICIAL MANURE

DURING the past fifteen years there has been in the United States a remarkable expansion of the business of growing mushrooms. According to the present practice, the growers must rely entirely on composted horse manure for making their beds. The industry consumes at least 150,000 tons of horse manure annually, and is still developing rapidly, while the horse is little more than holding his own. In view of these conditions, it is evident that the mushroom growers in the near future must have a substitute or supplement for horse manure. Several growers have succeeded in supplementing their manure to a certain extent by adding straw to the compost heaps, and a few have been experimenting with artificial compost. But it is apparent that there is a need for a further systematic search for material other than horse manure which is suitable for mushroom culture. To the writer, a straw compost made according to the principles laid down by Hutchinson and Richards[1] seemed to be a good starting-point. Therefore, in the summer and fall of 1928, several compost heaps were made

[1] This is now a patented process. It was originally published as follows: H. B. Hutchinson and E. H. Richards, "Artificial Farmyard Manure," *Journ. Minn. Agr. Great Britain*, 28: 398–411. 1921–1923.