# STUDENT'S HAND-BOOK

OF

# MUSHROOMS OF AMERICA

## EDIBLE AND POISONOUS.

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BY

THOMAS TAYLOR, M. D.

AUTHOR OF FOOD PRODUCTS, ETC.

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Published in Serial Form—No. 2—Price, 50c. per number.

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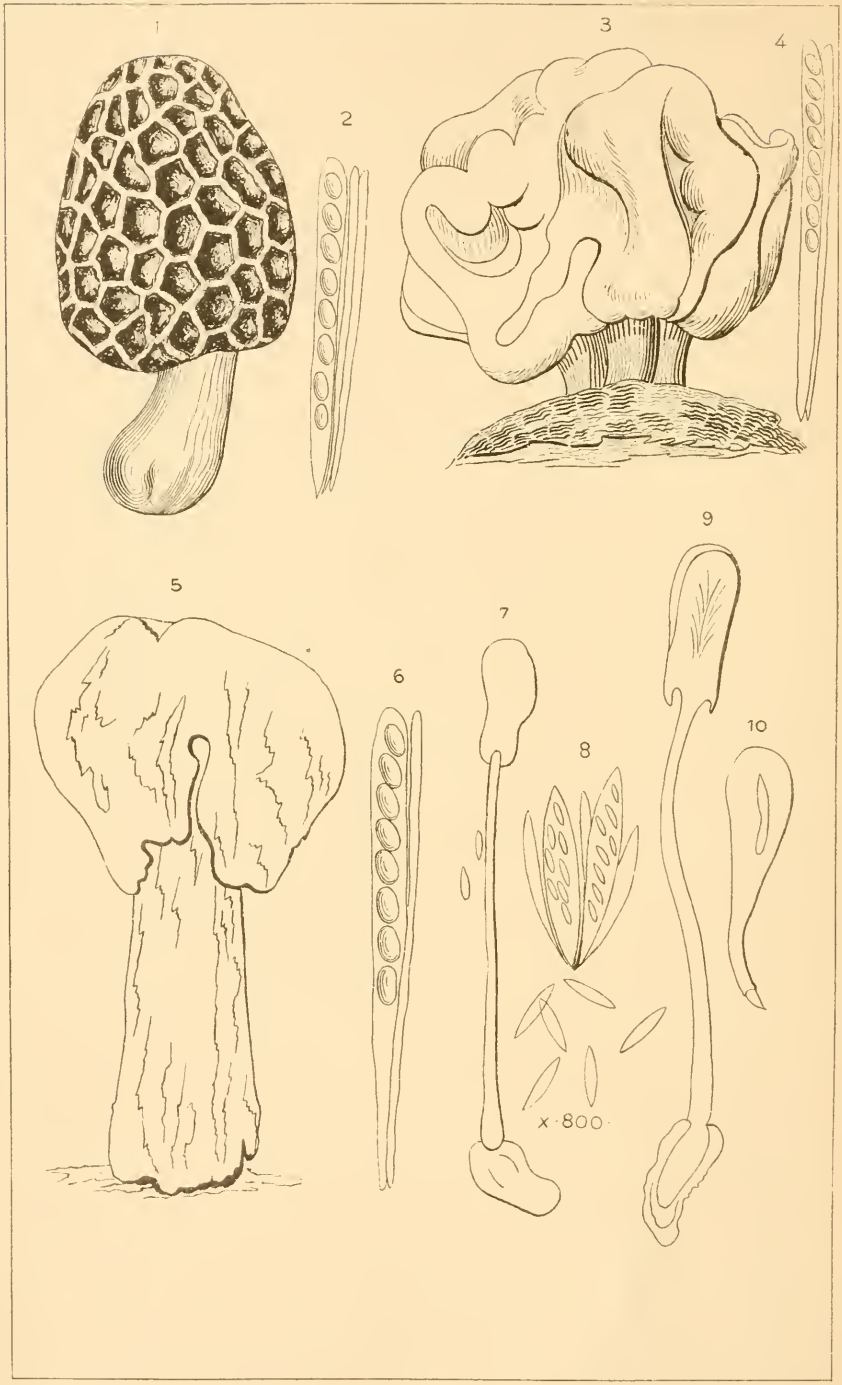
The ten mushrooms illustrated in the five plates contained in the first number of this series belong to the family Hymenomycetes. In the present number are presented illustrations representing three additional specimens of the Hymenomycetal fungi (Plates V, VI, and VII). There are also presented, in plates C and D, illustrations of nine species comprised in four genera of the sub family Discomycetes, of the family Ascomycetes.




T. TAYLOR, DEL.

TYPES OF FOUR OF THE LEADING GENERA OF DISCOMYCETES, IN WHICH OCCUR EDIBLE SPECIES.

## ASCOMYCETES.

Fruit, consisting of sporidia, mostly definite, contained in asci, springing from a naked or enclosed stratum of fructifying cells, and forming a hymenium.—Cooke and Berkeley.

Prof. J. de Seyne states that the three elements which form the hymenium in the families Hymenomycetes and Gasteromycetes are (1) the normal basidium, that is, the fruitful club-shaped cell which supports the naked spores, (2) the cystidium or sterile cell, an aborted or atrophied basidium, and (3) the paraphyses, hypertrophied basidium, the one organ, the basidium, being the basis of it all, according as it experiences an arrest of development, as it grows and fructifies, or as it becomes hypertrophied.

In the family Ascomycetes a minute ascus or spore case envelops the sporidia, and takes the place of the basidium, and the hymenium consists of (1) the asci containing the sporidia, (2) the paraphyses, and (3) a colorless or yellowish mucilage which envelops the paraphyses and asci. The asci are present in all species. In some species, however, the paraphyses are rare, and the mucilaginous substance is entirely wanting. The asci differ in shape and size, according to the species. The paraphyses, when present, are at first very short, but they rapidly elongate, and are wholly developed before the appearance of the asci. They are linear, simple or branched according to the species of plant, usually containing oily granules. There is some difference of opinion among mycologists as to the special functions of the paraphyses, some considering them as abortive asci, and others, like Boudier, as excitatory organs for the dehiscence of the asci, by which the spores are liberated.

The family Ascomycetes is rich in genera and species.

It consists largely of microscopic fungi, however, and the only group which will be considered here is that which includes plants of the mushroom family which are edible and indigenous to this country, viz., the subfamily Discomycetes.

## DISCOMYCETES.

The name Discomycetes, "disk-like fungi," does not give an accurate idea of the distinguishing charactertistics of this sub-family, the discoid form only belonging to the plants of one of its groups. In the Discomyceteæ the hymenium is superior, that is, disposed upon the upper or exterior surface of the mushroom cap. The sporidia are produced in membraneous asci, usually four or eight, or some multiple of that number, in each ascus; Cooke says "rarely four, most commonly eight." The sporidia are usually hyaline, transparent; colored sporidia are rare.

The asci are so minute as to be imperceptible to the naked eye; but if a small portion of the upper surface of the cap is removed with a penknife and placed under a microscope having a magnifying power of from

400 to 800 diameters, the asci, or spore sacks, can be separated and their structure studied.

Of the genera included in the Discomycetes the genus Peziza comprises by far the largest number of described species. The plants in this genus are generally small, thin, and tough. A few of them have been recorded as edible by European authors, but not specially commended; one form, Peziza *cochleata*, has been spoken of by Berkeley as being gathered in basketfuls in one county in England, where it is used as a substitute, though a very indifferent one, for the Morel.

Vittadini says the Verpa *digitaliformis* Persoon, a small brownish-colored mushroom, is sold in Italian markets for soups, but that, "although sold in the markets, it is only to be recommended when no other fungus offers, which is sometimes the case in the spring." P. *aurantia* Vahl., a small Peziza growing in clusters in the grass, is reported as edible by a member of the Boston Mycological Club, who speaks well of it.

The genera Morchella, Gyromitra, Helvella, and Mitrula contain, however, what may be considered the most desirable edible species. Types of these four groups are represented in Figs. 1, 3, 5, 7, and 10, Plate C.

The plants of these genera have a stem and cap. The cap, however, differs very much from that of the ordinary mushroom. In the genus Morchella the cap is deeply pitted and ridged so that it presents a honeycombed appearance. In Gyromitra the cap is convolutely lobed but not pitted. In Helvella the cap is very irregular and reflexed, and in Mitrula the cap is ovate or club-shaped and smooth. In all four of these genera the hymenium is superior, *i. e.*, it is on the upper and outer surface of the cap, the interior surface being barren.

In Plates C and D are figured 9 types of edible fungi included in the family Ascomycetes, sub-family Discomycetes.

## Plate C.

Fig. 1. Morchella esculenta Pers. "*Common Morel.*"

### Edible.

*Genus Morchella* Dill. Receptacle pileate or clavate, impervious in the centre, stipitate, covered with hymenium, which is deeply folded and pitted.—Cooke.

In this genus the species have a general resemblance to each other in size, color, form, texture, and flavor. The cap is usually a dull yellow, sometimes slightly olive-tinted, darkening with age to a brownish leather tinge. The stems are stout and hollow, white or whitish. This genus has a very wide geographical distribution, but the species are not numerous. Cooke describes twenty-four, some of them found in India, Java, Great Britain, Central and Northern Europe, Australia, and North America. Peck describes six species found in New York State. The lines of demarcation between species are not very decided; but as none of the species

are known to be poisonous, it may be considered a safe genus to experiment with.

In the Morchella esculenta the cap is ovate, in one variety rotund, the margin attaching itself to the stem; ribs firm and anastomosing, forming deep hollows or pits; color yellowish tan, olivaceous; spores hyaline, colorless; asci very long. The Morel, though rare in some localities, is found in large quantities in some of the midwestern States, sometimes in the woods along the borders of streams, often in peach orchards, at the roots of decaying trees.

I am informed by correspondents who have collected and eaten them that the Morels can be gathered in abundance in the springtime along the banks of the Missouri and tributary streams. A lieutenant in the United States Army informs me that he found fine specimens of this species in the mountains of California, five or six thousand feet above sea-level. A correspondent, Mr. H. W. Henshaw, writes that he has made many excellent meals of them, finding them on the banks of Chico Creek, Sacramento Valley, California, on Gen. Bidwell's ranch, in April. A correspondent in Minnesota writes: "The Morel grows abundantly in some places here, but so prejudiced are many of the natives against 'toadstools' that I had to eat the Morel alone for a whole season before I could induce any one else to taste it." Mr. Hollis Webster, of the Boston Mycological Club, reports the Morchella *conica* as appearing in abundance in eastern Massachusetts in May of this year. A correspondent in West Virginia reports that quantities of a large-sized Morel are found in the mountain regions there.

I have reports also of the appearance of the Morel in Western New York, and on the coast of Maine and of Oregon. A miner writes to me from Montana that he and several other miners, having lost their way in the mountains of that State during the spring of the year, subsisted entirely for five days on Morels which they collected.

The specimen represented in Plate C, Fig. 1, is figured from a Morchella *esculenta* which grew in the vicinity of Falls Church, Va., less than ten miles from the District of Columbia. The reports which I have received from correspondents in twenty States show that the Morel is not so rare in this country as was formerly supposed. The advantages which this mushroom possesses over some others are (1) the readiness with which it can be distinguished, (2) its keeping qualities, and (3) its agreeable taste. It is easily dried, and in that condition can be kept a long time without losing its flavor. Though it has not the rich flavor of the common field mushroon, it is very palatable when cooked, and when dried it is often used in soups. It is very generally esteemed as an esculent among mycophagists.

Fig. 2 represents the sporidia enclosed in the ascus, or spore sack, with accompanying paraphyses.

FIG. 3. Gyromitra *esculenta* Fries. "*Esculent Gyromitra.*"

*Genus Gyromitra* Fries. This genus contains very few species, but all are considered edible, though differing somewhat in flavor and digestibility. Five or six species are figured by Cooke. Peck speaks of several species found in New York. One of these, G. curtipes Fries, is also figured by Cooke as found in North Carolina. This species Cooke regards as equal in flavor to G. esculenta. G. esculenta has a rounded, inflated cap, irregularly lobed and hollow, smooth and brittle in texture, reddish brown. It falls over the stem in heavy convolutions, touching it at various points. The stem is stout, stuffed, at length hollow, whitish or cinereous: spores elliptical with two nuclei, yellowish, translucent. The plant is usually from two to four inches in height, but larger specimens are found.

Fig. 4 represents the spore sack with enclosed sporidia.

Mr. Charles L. Fox, of Portland, Maine, records the Gyromitra *esculenta*, of which he sent me a very good specimen last spring, as quite abundant during May in the open woods near the city named. Speaking of this species, he says: "From the point of view of their edibility, we have classed them under two heads—the light and the dark varieties. These differ in the locality in which they are found, in their color and in the convolutions of their surface. Both grow large.

"The *Light Gyromitra* is the more easily digested of the two. Its height varies from three to five inches, cap three to five inches in diameter. Its cap is inflated, very irregular, and twisted in large convolutions. These convolutions are almost smooth on the surface, sometimes showing small depressions; margin generally attached to the stem in parts. It is a transparent yellow in color. This variety does not grow dark brown with age. Stem white or very light buff, smooth, and hollow. It grows best on slopes facing the south, in scant woods of birch, maple, and pine. We have found no specimens in open places or on the borders of woods.

"The *Dark Gyromitra* is more common than the light variety. Its color is generally of dark lake brown, even in the young plant, though it is sometimes of a light warm yellow, which grows darker with age. Stem flesh-colored or pallid, but not white, nor so light as in the first variety. Its cap is similar in its large convolutions to that of the light variety, but it is covered with many intricate vermiform ridges, sometimes in high relief or even strongly undercut. Grows in mossy places, in light sandy soil, on borders of pine woods. Its flesh is brittle, but not so tender as that of the first variety. Both varieties dry readily. We should advise eating the *Dark Gyromitra* only in moderate amounts, as, if eaten in quantity, or if old specimens are used, indigestion or nausea is liable to follow. In regard to both varieties, I would advise that only young specimens should be eaten at first, as they are more tender and less pronounced in flavor than the older plants. We have eaten, however, a considerable quantity of the *Light Gyromitra* with no unpleasant results.

The flavor of the Gyromitras is quite strong, and some have found it too much so to be agreeable on the first eating. The general opinion here, however, is favorable to the Gyromitra as an excellent addition to the table."

Some German authorities speak well of the flavor of the G. esculenta, and it is sold in the German markets. Cordier records it as agreeable in taste when cooked. Peck says that he has repeatedly eaten it without experiencing any evil results, but does not consider its flavor equal to that of a first-class mushroom. He advises also that it should be eaten with moderation, and that only perfectly fresh specimens should be used, sickness having resulted from eating freely of specimens that had been kept twenty-four hours before being cooked.

I have not been fortunate in securing a sufficient quantity of fresh specimens to test its edible qualities personally, but the testimony received from those who have eaten it seems to point to the necessity for moderation in eating and care in securing fresh specimens to cook.

FIG. 5. Helvella crispa. "*Crisp Helvella.*"

*Genus Helvella* Linn. The plants of this genus are usually small, though a few of the species are of good size. They are not plentiful, but they are very generally regarded as edible, the flavor bearing a resemblance to that of the Morel. The cap has a smooth, not polished, surface, and is very irregular, revolute, and deflexed, not honeycombed like the Morel, nor showing the brain-like convolutions of the Gyromitras. Color brownish pale tan, or whitish. The stem in the larger species is stout, and sometimes deeply furrowed in longitudinal grooves, usually white or whitish.

The species Helvella crispa is white or pallid throughout, cap very irregular, sometimes deeply concave in the centre, with margin at first erect, then drooping; again it is undulating, much divided and deflexed: in fact, so irregular is the shape that scarcely two specimens will show the cap the same in outline; stem stout and deeply channelled. Spores elliptical, transparent. Habitat woods, growing singly or in groups, but not cæspitose.

Fig. 6, the ascus or spore sack and paraphesis.

*Genus Mitrula* Fries. Soft and fleshy, simple capitate, stem distinct, hymenium surrounding the inflated cap; head ovate, obtuse, inflated.—M. C. Cooke.

Cooke says of this genus that it is scarcely so well characterized as many with which it is associated, and that some of the species are evidently so closely allied to some of the species of the genus Geoglossum that it is difficult to draw the line of demarcation between them, particularly so with the species Mitrula *pistillaris* B. from Louisiana.

The plants are very small, and though none are recorded as poisonous, only one or two have any value as esculents.

Fig. 7. Mitrula sclerotipes Boudier.

The cap in this species is small, and the stem long and slender. The spores are transparent, the asci club-shaped. The plants of this species are always found springing from an oblong sclerotium; hence the name sclerotipes.

Fig. 8 represents the sporidia enclosed in their asci with paraphyses and individual spores, the latter magnified 800 diameters. Fig. 9, sectional view of mature plant.

Fig. 10. Mitrula vitellina Saac., var. *irregularis* Peck.

Saccardo, in his Sylloge Fungorum, includes in this genus those having a club-shaped cap, which brings into it, with others, the species Mitrula *vitellina* Sacc., formerly classed in the genus Geoglossum, and its variety *irregularis* Peck. The latter was first described in 1879, in Peck's Thirty-Second Report, under the name Geoglossum *irregulare*. Prof. Peck now gives preference to the name assigned to it by Saccardo, and it is so recorded in Peck's later reports.

Prof. Peck records this species as edible, and recommends it as having tender flesh and an agreeable flavor. It sometimes grows in profusion in wet mossy places, in woods, or swampy ground. It is bright yellow in color, clean and attractive. The cap is much longer than the stem, often deeply lobed, extremely irregular in outline, and tapers to a short yellowish or whitish stem. The spores are narrowly elliptical and transparent. The specimen illustrated is from a small one figured by Peck. The plants sometimes reach two inches in height. They are most abundant in temperate climates.

## Plate D.

In Plate D are represented four species of the genus Morchella, viz., M. *semilibera*, M. *bispora*, M. *conica*, and M. *deliciosa*. Morchella *esculenta* is figured in Plate C.

Fig. 1. Morchella semilibera De Candolle. "*Half Free Morel.*"

Edible.

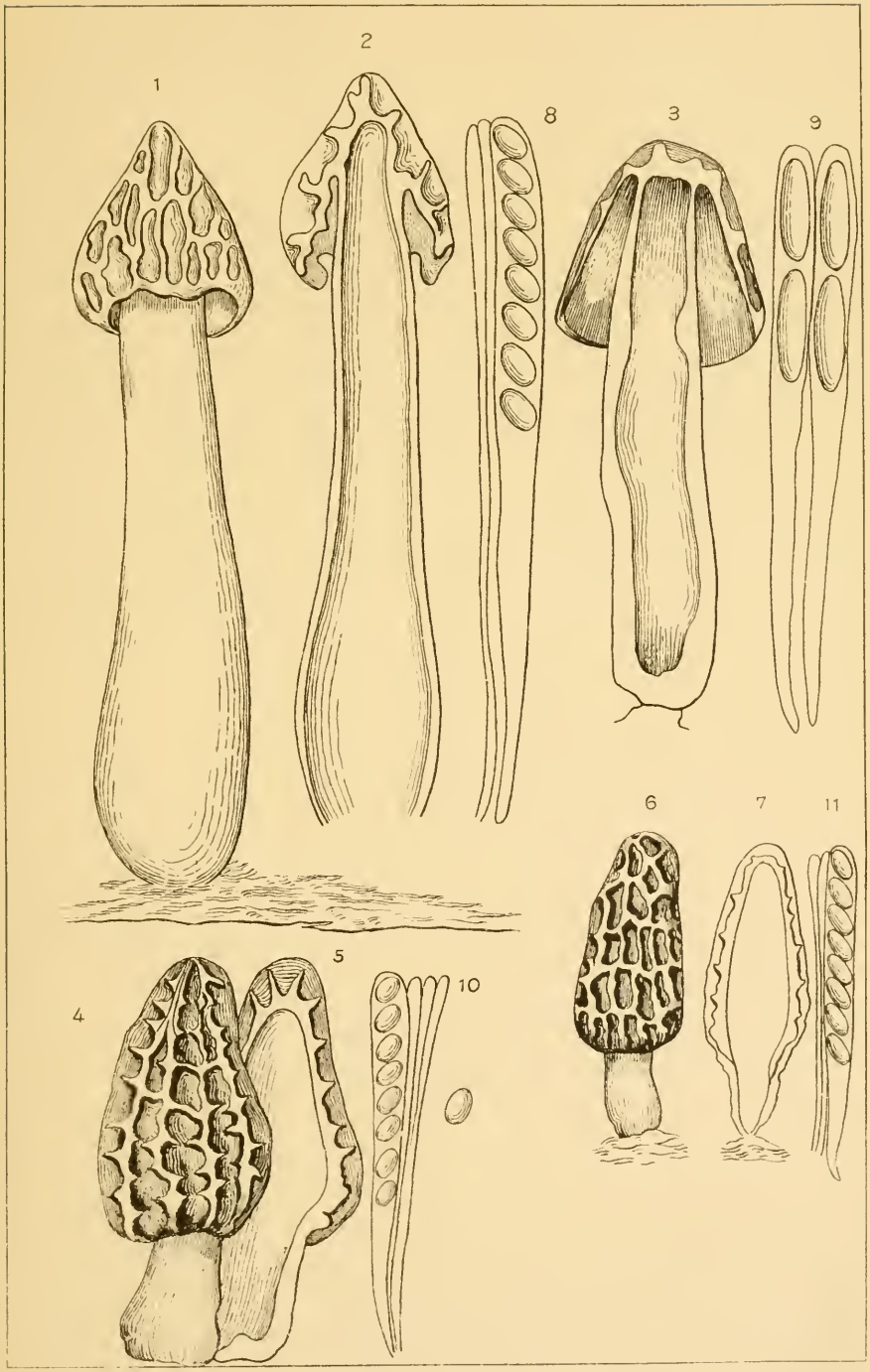
Cap conical but half free from the stem as the name of the species indicates. The ribs are longitudinal, forming oblong pits; stem hollow, much longer than the cap, white; spores elliptical. Peck says that this species has been described by Persoon under the name Morchella *hybrida*, and this name is adopted in Saccardo's Sylloge Fungorum, but most English writers prefer the first.

Fig. 2. Sectional view of Morchella *semilibera*.

Fig. 8. Sporidia of same inclosed in ascus with accompanying paraphyses.

FOUR TYPES OF THE GENUS MORCHELLA.

Plate D




T. TAYLOR, DEL.

FIG. 3. Sectional view of Morchella bispora Sorokin. "*Two-Spored Morel.*"

EDIBLE.

Cap free from the stem to the top, somewhat resembling that of M. *semilibera*, but blunt at its summit instead of conical, the outward surface deeply pitted, inner surface smooth and barren. A characteristic of this species which distinguishes it from others of the same genus is found in the number of its sporidia, spores as seen in the ascus or spore sack. In the plants of the genus Morchella the spore sacks, with one or two exceptions, contain eight spores.

In the species M. *bispora* the spore sacks contain but two spores and these are much larger than the sporidia of those which contain eight. This characteristic, however, can only be determined by the aid of the microscope.

Cooke figures a specimen taken from those published by Sorokin in Thumen's Exsiccata, and calls it a variety of Morchella *Bohemica* Kromb. He says that it is not unusual to find M. *Bohemica* with two or four sporidia in some of the asci, mixed with others containing more, some specimens being entirely tetrasporus, and some, as the variety *bispora*, usually containing but two sporidia. Cooke contends that M. bispora is simply a bisporous form of Morchella *Bohemica*, and calls it M. *Bohemica* var. *bispora*. It is not as common as other species.

Fig. 9 represents asci of M. bispora showing the two spores in each ascus.

FIG. 4. Morchella conica. "*Conical Morel.*"

EDIBLE.

Cap conical or oblong-conical, margin adhering to the stem, the prominent ridges longitudinal and irregularly bisected with shorter ones; the whole plant hollow throughout; color pale tan or ochraceous yellow, growing dingy and darker with age; stem white; spores elliptical.

This species is quite plentiful in some localities; the flavor is like that of M. *esculenta*.

Fig. 5. Sectional view of M. *conica*.

Fig. 10. Ascus, sporidia and paraphyses.

FIG. 6. Morchella deliciosa Fries. "*Delicious Morel.*"

Cap nearly cylindrical, blunt at the top, and usually much longer than the stem, adnate. Plant hollow throughout. Stem white. Spores elliptical.

Fig. 7. Sectional view of M. *deliciosa*.

Fig. 11. Ascus, sporidia, and paraphyses.

The Morchella *deliciosa* is highly esteemed as an esculent wherever eaten. Split open and stuffed with bread crumbs seasoned with pepper, salt, and butter and a pinch of thyme or onion, steamed in a hot oven, and served with butter sauce, this mushroom makes a very savory dish.

*Note.*—Small specimens have been selected for illustration in this plate in order to utilize as much as possible the plate space.

PLATE IV. STRUCTURE OF THE AGARICINI, GILL-BEARING MUSHROOMS.

Fig. 1. Cap or pileus umbonate, *a*; stem or stipe fistulose, tubular, *b*; gills or lamellæ adnate, and slightly emarginate.

Fig. 2. Gills remote, *i. e.*, distant from the stem. (See *a*.)

Fig. 3. Gills adnexed, partly attached to the stem at their inner extremity, *a*.

Fig. 4. Gills emarginate, with a tooth, as at *a*; stem stuffed.

Fig. 5. Cap obtuse, *e*; gills free, *i. e.*, reaching the stem but not attached thereto (see *a*); *b* stem stuffed.

Fig. 6. Cap umbilicate, slightly depressed in the centre, *b*; gills decurrent, *i. e.*, running down the stem. (See *a*.)

Fig. 7. Basidium, cell *a*, borne on the hymenium, or spore-bearing surface of the gills; *b*, stigmata; *c*, spores.

Fig. 8. Gills adnate, *i. e.*, firmly attached to the stem at their inner extremity, as at *a*.

Fig. 9. Cap, with border involute, *i. e.*, rolled inward. (See *a*.)

Fig. 10. Lamellæ or gills dentated or toothed. (See *a*.)

Fig. 11. Cap with border revolute, *i. e.*, rolled backward. (See *a*.)

## AGARICINI. Fries.

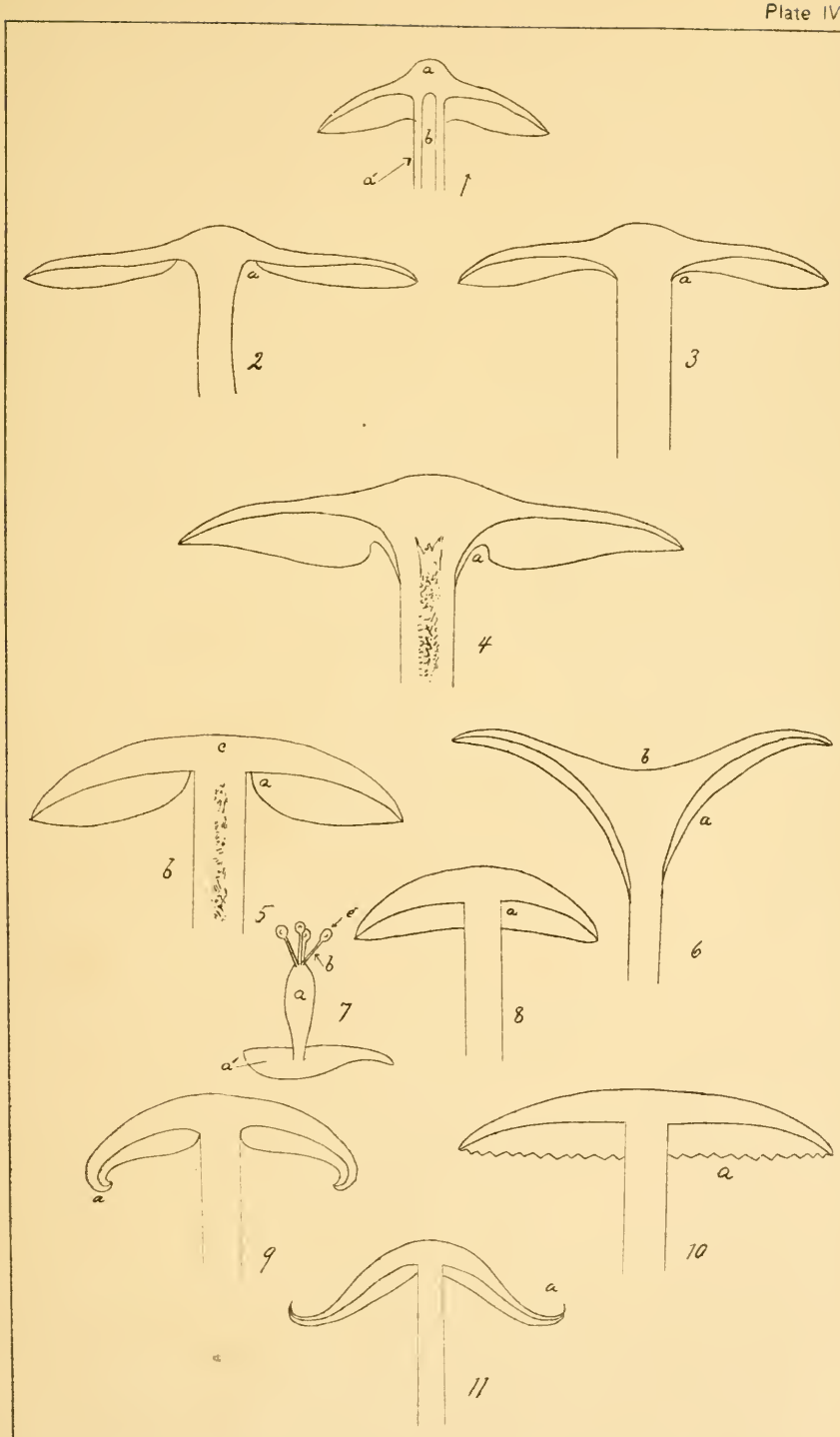
### LEUCOSPORI (SPORES WHITE OR YELLOWISH).

*Genus Lactarius* Fries. The plants of this genus have neither veil nor volva. They somewhat resemble the *Russulæ*, but can be readily distinguished from them by the greater fleshiness of the stem and by the milky juice which exudes from the flesh. The latter is a characteristic feature of the *Lactars*, giving to the group its name.

The species were originally arranged by Fries into groups according to the color and quality of the milk, and of the naked or pruinose character of the gills. Prof. Peck, however, considering the latter character not sufficiently constant or obvious to be satisfactory, in his early reports makes the color of the milk alone the basis of the primary grouping of the American species.

Saccardo, in his Sylloge, follows Fries in his classification of the species of the genus Lactarius.

In some species the milk is at first bright colored and continues unchanged; in others it is always white or whitish, and in others again it is at first white, changing to different hues on exposure to the air, becoming pinkish, pale violet, or yellow. In one species (C. indigo) both plant and milk are of indigo blue. The taste of the milk varies, as does that of the flesh, according to species. Sometimes it is mild or very slightly acrid, and again it resembles Cayenne pepper in its hot, biting acridity. It is somewhat viscid or sticky in character, and permeates to some extent the whole




LACTARIOUS DELICIOSUS.

1 General form. 2 Section 3 Spores.

Becker & Wilhelms Lithographing Co. New York

flesh of the mushroom, but is most profuse in the gills, where in fresh young specimens it is seen exuding on the slightest pressure. In old or wilted specimens it does not flow so freely, but may be found by breaking off portions of the cap.

The plants usually present a fleshy cap, the flesh quite brittle, and breaking in clean, even fractures. In a number of the species the upper surface of the cap shows bands or zones of warm coloring, not found in any of the species of the allied genus Russula. The gills are sometimes even, more often forked, acute on the edge, color white or whitish, but changing to yellowish or reddish tints as the plants mature, or when cut or bruised. While they are at first adnate they become, with the expansion of the cap, somewhat decurrent, showing in this particular a resemblance to the plants of the genus Clitocybe. The stem is central, except in a few species, where it is eccentric or lateral, notably the latter in L. obliquus: spores white or yellowish, according to species; Cooke says, "rarely turning yellow." They are globose, or nearly so, and slightly rough.

This genus is a large one, and contains many acrid species. Out of fifty-three described and figured by Cooke, more than half are given as having the milk more or less acrid. More than forty species have been recorded as growing in this country, and many of these are extremely acrid in taste.

A number of the species are edible, while others have been recorded as deleterious, poisonous, etc. L. torminosus, L. piperatus, and L. insulsus are species about which there seems to be difference of opinion among authors as to their wholesomeness or edibility, some contending that, in spite of their extreme acridity, they are edible when cooked, and others that they are deleterious in their effects. L. *deliciosus* and L. *volemus* have a good reputation in this country as well as abroad, and are quite abundant in some localities. They are more frequent in temperate climates than in northern latitudes or in the tropics.

## Plate V.

Lactarius deliciosus Fries. "*Delicious Lactarius*," *or* "*Orange Milk Mushroom.*"

Edible.

Cap fleshy, viscid, at first convex, then nearly plane, becoming much depressed in the centre, funnel-shaped, marked in the adult plant with rings or rust-colored zones. Color of the cap dull orange, turning paler, and grayish or greenish yellow when old or dried; margin at first turned inwards; flesh whitish or tinged with yellow; gills decurrent, crowded rather thick, sometimes slightly forked at the base, pale yellow, sometimes a saffron yellow, exuding when bruised a saffron-red or orange-colored liquid, hence the popular name of "Orange Milk Mushroom;" stem smooth, somewhat spotted, stout, stuffed with a yellowish pith, eventually becoming hollow; color about the same as that of the cap. Spores subglobose, yellowish. Taste mild or very slightly acrid when raw.

Mycophagists generally concur in the opinion that it is of very pleasant flavor when cooked, and some speak very enthusiastically of its esculent qualities.

Over-cooking is apt to make it tough. I find steaming in the oven with butter, pepper, and salt, and a very small quantity of water, as oysters are steamed, a very good method of preserving the juices and flavor.

It is found in Maryland, under the pines and sometimes in mossy and swampy places. Prof. Underwood, President of the New York Mycological Club, reports it as fairly abundant in Connecticut.

Lactarius *volemus* Fries, the "Orange-Brown Lactar," somewhat resembles the L. *deliciosus* in shape and size, but the cap is dry and glabrous and the skin is apt to crack in patches in somewhat the same manner as does that of the Russula *virescens*. It is a warm orange-brown in color, varying slightly with age, and is not zoned. The gills are white or yellowish and crowded, adnate in the young specimens, and decurrent in the mature, exuding a white milk when bruised. The spores are globose, and white. It is found in open woods. The flavor is much like that of L. *deliciosus*, although perhaps not so rich.

One author states it as his experience that the Lactars which have *bright*-colored milk, unchanging, are usually edible and have a mild taste. L. *indigo* Schwein has been recorded as less abundant than some other species, but edible. The plant is a deep blue throughout, the milk of the same color and unchanging. The taste of both flesh and milk is mild. Specimens of this species were sent to me from western New York several years ago by a correspondent who found it growing in quantities in a corn field. He had cooked several dishes of it, and reported its flavor as very agreeable.

L. *vellereus* and L. *piperatus* are very common in fir woods. The plants are large and stout, white throughout, the milk white and excessively acrid; gills decurrent, unequal and narrow. The milk in *vellereus* is apt to be scanty but copious in *piperatus*.

Of L. *piperatus*, Worthington Smith says: "So strongly acrid is the milk that if it be allowed to trickle over tender hands it will sting like the contact of nettles; and if a drop be placed on the lips or tongue the sensation will be like the scalding of boiling water." He records it as "poisonous." Fries and Curtis say that, "notwithstanding its intense acridity, it is edible when cooked." Cordier, while recording it as edible, says that the milk, and butter made from the milk of cows fed with it, are bitter and nauseous, although cows eat it with avidity. Gibson, while quoting one or two authors as to its edibility when cooked, says: "Its decidedly ardent tang warns me not to dwell too enthusiastically upon its merits in a limited selection of desirable esculents." The Secretary of the Boston Mycological Club, writing in the Club bulletin, says, "it has been eaten as a sort of duty after the acridity was cooked out,"

Section.

Spores.

AGARICUS (ARMILLARIA) MELLEUS.

Group from Hynesboro Park, Md., U.S.

K. MAYO, del.

but does not commend it. It is spoken of as "an unattractive fungus which usurps in the woods the place that might well be occupied by something better." In this opinion I fully concur.

L. *torminosus*, "*Wooly Lactarius*," sometimes called the "*Colic Lactarius*," has been termed acrid and poisonous by Badham. Cordier and Letellier, on the other hand, say that it can be eaten with impunity when cooked. Gillet declares it deleterious and even dangerous in the raw state, constituting a very strong and drastic purgative. One author states that, although it does not constitute an agreeable article of food, it is eaten in some parts of France and in Russia. Considering the differences of opinion which exist with regard to this and other extremely acrid species, it would seem the part of prudence for persons with delicate stomachs to avoid the use of very acrid species, for, though the acridity may be expelled by cooking, there would seem to be no necessity for risking unpleasant or dangerous results while the range of unquestionably wholesome and agreeable species is sufficiently wide to satisfy the most enthusiastic mycophagist.

## AGARICINI.

### Leucospori (spores white or yellowish).

Armillaria Fries. Cooke places Armillaria in the order Agaricini, *genus Agaricus*, making of it a *sub*-genus. Saccardo, in taking it out of Agaricus, elevates it to the position of a separate genus. The name Armillaria is derived from a Greek word, meaning a ring or bracelet, referring to its ringed stem.

In the plants of the Armillaria the veil is partial in infancy, attaching the edge of the cap to the upper part of the stem; the stem furnished with a ring. Below the ring the veil is concrete with the stem, forming scurfy scales upon it. The gills are broadly adnexed. In abnormal specimens the ring is sometimes absent, or appearing only in scales, running down the stem. Spores white. The species are few; eight are recorded as growing in the United States. Cooke describes twelve species found in Great Britain.

### Plate VI.

Ag. (Armillaria) melleus Vahl. "*Honey-Colored Armillaria.*"

Edible.

Cap fleshy, rather thin at the margin, at first subconical, then slightly rounded, or nearly plane, clothed with minute hairy tufts; margin sometimes striate, color varying, usually a pale-yellowish or honey color or light reddish brown; flesh whitish. Gills whitish or paler than the cap, growing mealy with the shedding of the profuse white spores, and often spotted with reddish-brown stains, adnate, ending with decurrent tooth. Stem fibrillose, elastic, stuffed or hollow, ringed, and adorned with floccose scales which often disappear with age; in some varieties distinctly bulbous

at the base, in others showing tapering root. Specimens occur in which the ring is wanting or only traces of it appear in the form of scales encircling the stem. Veil usually firm, membraneous, and encircling the stem in a well-pronounced ring or collar, but sometimes filmy as a spider's web, in very young specimens hiding the gills, but breaking apart as the cap expands.

Manner of growth cæspitose, generally on decayed tree stumps, although the group figured in the plate was found growing on moist sand, mixed with clay, on a roadside in Hynesbury Park.

Authors differ widely as to the value of this species as an esculent. I have only eaten the very young and small specimens when cooked, and found them very palatable. A Boston mycophagist records it as "very good," fried after five minutes' boiling in salted water. Prof. Peck, having tried it, considers it "a perfectly safe species, but not of first-rate quality." It is very common in Maryland and Virginia, and in the mountain districts prolific. I have talked with Bohemians and with Germans who have gathered it in basketfuls in the vicinity of the District of Columbia, who speak well of it, considering it a valuable addition to the table. Its prolific growth makes it valuable to those who like it. There are no species recorded as dangerous in this group.

Ag. (Armillaria) robustus, a very stout species, with a fleshy, compact, smooth cap, bay color or tawny, occurs in the Maryland woods, and in the open woods of the Massachusetts coast.

## AGARICINI. Fries.

*Genus Cantharellus* Adans. In the plants of this genus the hymenophore or fleshy substance of the cap is continuous with the stem. They are fleshy, membranaceous, and putrescent, having neither veil, ring, nor volva. The stem is central, except in a few species, where it is lateral. A characteristic of the genus which separates it from other genera of the Agaricini is the vein-like appearance of the gills. They are very shallow and so obtuse on the edges as to present the appearance of a network of swollen branching veins. They are usually decurrent and anastomosing. It is a small genus. Cooke figures nineteen species. Among the described species C. cibarius is the only one whose edible qualities have been highly recommended. C. umbonatus, a very small plant, found in eastern Massachusetts is commended by those who have eaten it. They are usually found in woods, and amongst moss. One species, *C. carbonatus*, is found upon charred ground.

### Plate VII.

Cantharellus cibarius Fries. "*The Edible Chantarelle.*"

Edible.

Cap a rich golden yellow, like the yolk of an egg; at first convex, later concave and turbinated; margin sinuous, undulate, smooth, shining, and


CANTHARELLUS CIBARIUS FR.

1,2,3,4, Various stages of growth 5 A section.
6 Spores 7 Spores and basidia.
From Hynesbury, Md., U.S.

more or less lobed; diameter from two to four inches; flesh pale yellow or whitish; veins or gills rather thick and wiry, remarkably decurrent, usually very much bifurcated and of the same golden yellow as the cap; stem solid or stuffed, slightly attenuated downwards, yellow; spores white or pale yellowish, elliptical.

European authors esteem it very highly, and some speak of the odor as like that of ripe apricots. The plant as found in Maryland and Virginia has a slightly pungent but agreeable taste when raw, and a pleasant odor when cooked. It is ranked as one of the best of the wood mushrooms by those who have eaten it in this locality (District of Columbia). It is found here in abundance, after light rains, in fir woods. Berkeley states that it is somewhat rare in England, where it is held as a delicacy, but quite common on the continent. We have had specimens from various localities throughout the States. Cooke says the spores are white. Peck and Gibson record them as yellow. I find them white, sometimes slightly tinted with yellow.

The *Chantarelle* takes its name from a Greek word signifying a cup or vase, referring to its shape and possibly also to its rich golden color; *cibarius* refers to its esculent qualities.

The variety *rufipes* Gillet closely resembles C. *cibarius*, but is darker, with the stem *rufous*, reddish, at the base.

C. *aurantiacus* Fries bears a sufficient resemblance to C. *cibarius* to be sometimes taken for it, although the cap is tomentose and of a much deeper orange in tint, the gills more crowded, darker than the cap, and the stem less stout. In the variety *pallidus* the whole plant is very light or buff yellow, and the gills nearly white. C. aurantiacus has been recorded as poisonous or unwholesome by some of the earlier authors, others say that they have eaten it, but do not commend it.

## RECEIPTS FOR COOKING.

*Stuffed Morels.*—Choose the freshest and lightest colored Morels, open the stalk at the base, fill with minced veal and bread-crumbs, secure the ends of the stalk and place between thin slices of bacon.

The Morel should not be gathered immediately after heavy rains, as it becomes insipid with much moisture. The flavor is said to grow stronger in drying.

*Escalloped Mushrooms.*—(From Mr. Frank Caywood, Fredericktown, Ohio, November 14, 1893.) Season as directed in the usual methods for mushrooms and add a small quantity of vinegar to hasten the cooking. Cook slowly until tender; rapid boiling evaporates the flavor. When done, put in from a pint to a quart of sweet milk and heat. Take a pudding dish and put in a layer of broken crackers; light milk crackers are the best. Put lumps of butter and pepper and salt over the crackers. Next a layer of the tender mushrooms with some of the hot gravy and milk. Continue these layers until the dish is full, having a layer of

crackers on top. Place the dish in the oven and bake slowly until the crackers are browned.

*Mushroom Fritters.*—Take nice large tops, season, and dip into batter and fry in hot butter as other fritters.

*Mushrooms en ragout.*—Put into a stewpan a little "stock," a small quantity of vinegar, parsley, and green onions chopped up, salt and spices. When this is about to boil, the cleaned mushrooms are put in. When done remove them from the fire and thicken with yolks of eggs.

The Lactarius *deliciosus* may be served with a white sauce or fried. Badham says the best way to cook them is to season first with pepper, salt, and small pieces of butter, and bake in a closely covered pie dish for about three quarters of an hour.

The Cantharellus, being somewhat dry, requires more fluid sauce in cooking than the juicier mushrooms, and is best minced and slowly stewed until quite tender. Some advise soaking it in milk a few hours before cooking. The Italians dry or pickle it or keep it in oil for winter use.

Persoon gives the following recipes for cooking the Morel: 1st. Wash and cleanse thoroughly, as the earth is apt to collect between the ridges; dry and put them in a saucepan with pepper, salt, and parsley, adding or not a piece of bacon: stew for an hour, pouring in occasionally a little broth to prevent burning; when sufficiently done, bind with the yolks of two or three eggs, and serve on buttered toast.

2. *Morèlles à l'Italienne.*—Having washed and dried, divide them across, put them on the fire with some parsley, scallion, chives, tarragon, a little salt, and two spoonfuls of fine oil. Stew till the juice runs out, then thicken with a little flour; serve with bread crumbs and a squeeze of lemon.

## Mushroom Growing.*

To France is due the credit of being the first country to cultivate mushrooms on a large scale, and France still supplies the markets of the world with canned mushrooms. The mushroom which is cultivated in the caves and quarries of France, to the exclusion of all others, is the agaricus arvensis (the "Snowball"), a species of field mushroom.

Of late years France has found a formidable competitor in the culture of mushrooms in Great Britain. The English market gardeners find their moist, equable climate favorable to outdoor culture, and abundant crops are grown by them in the open air, chiefly, however, for the home market.

That mushroom growing can be made a lucrative business is shown by the experience of a well-known English grower, Mr. J. F. Barter, who on one acre of ground has produced in the open air, without the aid of glass, an average of from ten to twelve thousand pounds of mushrooms annually; the price obtained for them varying according to the season, but averaging ten pence, or twenty cents, per pound for the whole year. The

* A part of the matter presented under this caption was contributed by the author to the Health Magazine and appeared in the March number (1897) of that periodical.

value of twelve thousand pounds of mushrooms at ten pence per pound would be £500 sterling or $2,500.

For the purposes of comparison the following are quoted from the Pall Mall Gazette, as exceptional prices realized in England for other fruits and vegetables in recent years:

Pounds sterling per statute acre:

Very early gooseberries, 100; onions, 192; early lettuces, 100; plums, 100; potatoes, 100; strawberries, 150; black currants, 168; filberts, 200.

It will be seen that onions and filberts head the list, but the product of an acre of mushrooms has been shown to be worth more than double that of either filberts or onions.

In the localities specially favorable to hop growing 30 cwt. of hops to the acre is considered exceptional, while the average price has been quoted at 3 pounds sterling, or about one-fifth of the sum obtained from Mr. Barter's acre of mushrooms. Three months in the year the weather does not favor outdoor culture, and these months Mr. Barter spends in manufacturing brick spawn, which he exports to this and other countries. Among those who have been very successful in indoor culture are Mr. William Robinson, editor of the "London Garden," and Mr. Horace Cox, manager of the "Field."

In America, where mushroom culture is still comparatively in its infancy, there have already been obtained very encouraging results by painstaking growers. Most of the cultivation has been in the northern and mid-western States, where the climatic conditions seemed most favorable to indoor culture. A few figures as to the revenue obtained in this way may be interesting to readers.

An experienced Pennsylvania grower states that from a total area of 5,500 square feet of beds, made up in two mushroom houses, he obtained a crop of 5,000 pounds of mushrooms in one season, or about one pound to the square foot. These sold at an average of a little over 50 cents per pound. A third house, with 19,000 square feet of beds, produced 2,800 pounds, or one and one-half pounds to the square foot. This house yielded a net profit of one thousand dollars. This, however, can be quoted only as showing the possibilities of careful culture by experienced growers under very favorable circumstances. Amateurs could scarcely expect such good results. Three-fourths of a pound to the square foot would probably come nearer the average. A Philadelphia grower gives the average price secured from fifty shipments of mushrooms in one season at 54 cents per pound. New York dealers report higher rates than this. A Washington florist who utilizes the lower shelves of his propagating houses for the purpose of mushroom growing informed me that during two seasons he received 60 cents per pound wholesale, shipping to New York, and that he sold one thousand dollars worth in one season. Mr. Denton, a market gardener of Long Island, who cultivates in houses built for the purpose, markets from 1,700 to 2,500 pounds per year.

Thus far the market is in the hands of a comparatively few dealers in the neighborhood of large cities, but there is certainly no good reason why the growing of mushrooms should not be more generally undertaken by the farming community. Certainly no one has better facilities than are at the command of the enterprising American farmer. On most farms the conditions are favorable or could easily be made so for mushroom culture, on a moderate scale, at least. Generally there are disused sheds, old barns, etc., which with a small outlay could be transformed into mushroom houses, and where timber is plentiful the cost of building a small

mushroom house would be repaid by the profits accruing from the business.

In the culture of mushrooms there are open, to the enterprising with small capital, four sources of profit: first, the sale of the fresh mushrooms; second, the manufacture of mushroom catsup; third, the canning of the small button mushroom for exportation: and, fourth, the manufacture of spawn.

It is well in this, as in all new industries, to begin in a small way, and if success is attained it is easy to extend operations on a larger scale. My advice to amateurs is to begin with one or two beds in a well-drained cellar or shed where good ventilation and even temperature can be secured at moderate cost. In the underground cellar economy is secured by the saving in fuel. The beds can be made on the floor, flat, ridged or banked against the wall, ten or twelve inches deep in a warm cellar, and from fifteen to twenty inches in a cool cellar. The boxing for the sides and ends may be built six or eight inches higher than the beds to give the mushrooms plenty of head room.

### DIRECTIONS FOR PREPARING THE COMPOST FOR THE BEDS.

Procure not less than a cartload of clean, fresh stable manure. Place it under cover, to protect it from rain and drain water, mix well and heap up the whole mass into a mound three feet high then beat the mound firmly down to prevent undue heating. Repeat this operation every other day until its rank smell is gone, taking care that on each turning the outside dry manure is placed in the centre of the mound. By this means the stable odor is dissipated while its heating properties are equally distributed. Add to this from one-fourth to one-fifth of clean, rich garden mould. Mix well. After this careful handling, the mass may be considered fit for bedding purposes. When placed in the beds the mass should be compacted again by beating with the back of a spade or trowel. The bed surface should appear moist but not wet, smooth and of firm consistence. From day to day it will be necessary to test its general temperature by means of a thermometer. To this end make at various places at different depths openings sufficiently large to admit the use of a thermometer. It will be found that the temperature is highest nearest the bottom. Test at various points. At first the temperature will run high; 105° to 120° Fahrenheit is probably as high as it will reach, but in a few days it will fall to 85° or 80° Fahrenheit. At this point spawn the bed. For this purpose make holes in the top of the bed about six inches apart and two inches deep with a blunt dibble or broom handle. Place in these holes or openings a piece of brick spawn about the size of a hen's egg, and cover the holes with manure; finish by packing the same, keeping the surface of the bed smooth and moist. The spawn should be slightly moistened before using. Should the surface of the bed become dry, use water from a fine sprinkling pan. The temperature of the cellar or house in which the bed may be placed should range between 55° and 75°, and should not be lower than 50°. If the spawn is good and all conditions attended to, the white filaments should appear spreading through the bed within eight or ten days after spawning. When the white spawn is observed on or near the surface, cover the whole surface with from one to two inches of garden loam well pulverized. A good general rule for spawning the bed is to wait until the heat of the bed is on the decline and has fallen to at least 90° Fahrenheit. If the heat in the middle of the bed runs too high the

spawn is killed. The experience of a number of growers has shown that a bed spawned at 60° to 80° and kept at 55° after the mushrooms appear gives better results than one spawned at 90°.

The quality of the manure makes some difference in its temperature. That obtained from stables where horses are grass fed will be of lower normal temperature and will chill quicker than that obtained from corn or oat fed stock.

A solution of saltpeter in proportion of about fifteen grains to a quart of water, occasionally spread over the bed with a fine hose, helps to accelerate the growth of the mushrooms.

The proper condition of the manure as regards dryness or moistness can be readily ascertained by squeezing it in the hand; it should be unctuous enough to hold together in a lump, and so dry that you cannot squeeze a drop of water out of it. Excessive moisture in the manure has been often a cause of failure. It should be remembered also that when the heat of the manure is on the decline it falls rapidly, five, often ten degrees a day, till it reaches about 75°, and between that and 65° it may rest for weeks.

One of the principal causes of the failure of mushroom culture in this country is the use of old or poor spawn. Good spawn should have a fresh, mushroomy odor, and a bluish-white appearance on the surface. In buying spawn one should always go to reliable seedsmen.

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### Compost for Mushroom Beds.

Sawdust has been used in England for mushroom beds, after having been used for stable bedding, with very good results. It has also been used successfully in the District of Columbia. In fact, the very large models of cultivated mushrooms exhibited by the Division of Microscopy of the Department of Agriculture at the World's Fair in Chicago were moulded from mushrooms which were grown on the writer's premises, in a composition of sawdust stable bedding, combined with about one-fourth garden mould, but I am confident, at the same time, that much depends on the kind of timber the sawdust is made from. In this case the sawdust came from spruce.

### Mushroom Culture in Canada.

A Canadian correspondent informs me that he, with others, has been very successful in growing mushrooms in the open air during the summer months in Canada, and gives the following directions for preparing the beds in the colder latitudes:

Place under a shed such amount of clean stable manure as may be required for the beds, turning it over and over until all free ammonia has escaped and the tendency of undue fermentation and evolution of high temperature has greatly modified. To effect this, it is necessary to heap up the manure each time in a mound, say three feet high after turning, and beat it firmly down (the exclusion of free air prevents overheating). To put the manure in proper condition for use in the beds, from two to four weeks' treatment may be required, but much depends on the quality of the manure and temperature of the atmosphere. Before making the beds, and several days after the last turning, test the internal temperature of the mound in the following manner: Make a hole with a broomstick through the mound from top to bottom, and suspend a thermometer half way down in the hole for, say, an hour. The temperature may

be as high as 150° F. After the lapse of the time stated, beat the mound more firmly down to prevent rise of temperature. Test again two days after in the same manner. If the temperature has risen several degrees the mound must be again taken down, turned over, and remade. If, on the other hand, the temperature has fallen to 100° F., the permanent bed may be made. If indoor growth is desired, such as a cellar, outbuilding, or cave, the atmosphere must not fall below 50° F., nor be over 80° F. Air drafts cannot be permitted. The floor must be dry and the atmosphere moist. The cellar may be dark, or moderately light. Growers differ in opinion in this respect. Growers generally add to the the manure about one-fourth or one-fifth garden soil, but success has been attained without the use of garden soil, except as surface dressing after spawning the bed; an excessive use of loam, in any case, tends to lower the temperature too rapidly. Having prepared a box or frame-work for the bed twelve inches deep, fill it up to within two inches of the top; beat gently down with a board, or a brick, until it is even and compact. On the following day make holes in the bed, with a dibble, ten inches deep, in which suspend a thermometer half way down for an hour. Should the temperature have fallen to 90° F., cover lightly with straw and test on the following day. Should the temperature prove to be going down, say to 80° F., or 85° F., it is safe to plant the spawn; but should the temperature be on the rise, wait until it is falling. One grower has stated that his greatest success has been when the spawn was planted at the temperature of 75° F. Should the temperature fall too quickly and the surfare be too dry, sprinkle with water at blood heat, using a very fine hose, and cover the bed with straw.

The spawn brick should be cut into pieces, about the size of an egg, and planted in holes made in the bed, about two inches deep and about six inches apart. The holes are then filled up and about two inches of garden soil sifted over the surface of the bed. Tamp the bed surface gently with the back of a spade. Mushrooms may be expected for table use in about six or seven weeks, provided the spawn is good and the temperature has not fallen below 50° F. In outdoor culture the beds must be well covered with straw or canvas, and had better be under a shed roof with southern exposure.

The spawn used by this grower is the "brick" spawn, imported from Carter & Holborn, London, England.

### Cultivation of Mushrooms in Japan.

The Japanese are very successful in cultivating a mushroom which they call "Shiitake" or "Lepiota shiitake." China also produces the same mushroom, but of an inferior quality. The Chinese therefore prefer the mushroom cultivated by the Japanese, which they import from Japan in large quantities. It is cultivated on a variety of trees, but is said to grow best on the "Shiinoki," a species of oak (Quercus cuspidata).

There are three varieties of "Shiitake," the spring, summer, and autumn crops differing somewhat in quality. The method of growing the "Shiitake" is given by the Japanese Commissioner of Agriculture as follows:

"Trees of from twenty to fifty years' growth are cut down at the approach of winter when the sap has ceased to run, and after the lapse of twenty or thirty days, according to the condition of the drying of the wood, are sawed into logs of 4 or 5 feet in length. Into each of these logs incisions are made with a hatchet, at intervals of about 6 inches, and they are piled regularly upon a frame-work erected at a height of about

1 foot above the ground, under the trees. The location of the ground selected for piling the logs should be the slopes of a forest, facing southeast or southwest. After keeping the logs as above described for from two to three years, they are immersed in water for twenty-four hours in the middle of November, and again laid one upon another for about four days; if it is in a cold district, the pile is covered with straw or mats. At the expiration of the fourth day the logs are obliquely tilted against poles fixed horizontally to the trees at a height of about 4 feet in a well-ventilated and sunny situation. The mushrooms soon appear in quantity, and, after twenty or thirty days' growth, are ready for harvesting."

Recent reports of the Japanese Agricultural Department show the total value of the annual export of "Shiitake" to be nearly five hundred thousand "yen" (silver).

### Manufacture of Spawn.

As many tons of artificial spawn are yearly imported into this country, it would seem that the manufacture of spawn in the United States might prove a profitable form of investment.

### "Brick Spawn."

For commercial purposes the English method of making the spawn into bricks has some advantages over the French "flake" process. Its compact and uniform shape makes the brick more convenient for storage and general handling, and greatly facilitates its transportation to long distances. Brick spawn is made in the following manner: Clean horse droppings, cow manure, loam, and road sweepings are beaten up in a mortar-like consistency and then formed into bricks, moulds being used, slightly differing in shape with different makers, but usually thinner and wider than common building bricks. The following proportions are given: (1) Horse droppings the chief part; one-fourth cow dung; remainder loam. (2) Fresh horse droppings mixed with short litter for the greater part; cow dung, one third; and the rest mould or loam. (3) Horse dung, cow dung, and loam, in equal parts. When about half dry, depressions are made in the bricks, sometimes in the centre, and sometimes in each corner, and small pieces of good spawn are placed in these depressions, and plastered over with the material of the brick. The cakes are then laid out to dry, standing on their edges, and when nearly dry are piled in pairs with the spawn-larded surfaces face to face. The bricks are then stacked away, and covered with sweet fermenting litter, sufficiently to cause a heat of 60° F. It should not be over 70° F. One spawn manufacturer says that the most rapid and successful growth of the mycelium is attained when the temperature is from 63° F. to 67° F. The bricks are examined frequently during the process, and when the mycelium of the old spawn has permeated the whole mass like a fine white mould, the bricks are taken out and dried in a well-ventilated dark place. They are then placed in a cool, dark storehouse, where they are not subject to dampness and where the temperature is about 50° F., not over 65° or below 35° F. Slight ventilation is necessary, but not enough to make the bricks dust-dry. Keeping the spawn dry merely suspends its growth; as soon as it is again submitted to favorable conditions of moisture and heat, its pristine activity returns. Dampness, combined with heat, stimulates the growth of mycelium: frost also destroys the vitality of the spawn. It is evident, therefore, that these conditions should not exist in the store-room.

One manufacturer advocates piling the bricks, after spawning, on a clay floor, packing closely four bricks deep, and covering them with sifted

loam. By this method it is claimed that danger of "fire fang" will be avoided, as the bricks will be kept at a perfectly uniform temperature of about 60° or 66°, which causes the spawn to run quickly and uniformly. In from four to six weeks they are ready to take out and dry for use or storage.

The French or "Flake" spawn comes in light masses of loose, dry litter. It is obtained in the following way: A bed is made up as if for mushrooms in the ordinary way, and spawned with "virgin" spawn, and when the bed is thoroughly impregnated with spawn, it is broken up and set aside to dry. This spawn is usually sold in small boxes, containing from two to five pounds, but it also can be obtained in bulk when it is purchased by weight. The French or "flake" spawn is much more expensive than the English or "brick" spawn. It is claimed by some very successful growers, who have tried both, that the brick spawn produces heavier and fleshier mushrooms than the French "flake."

### "Mill Track" Spawn.

"Mill track" spawn was formerly considered the best in England, but since horse power has given place to steam power in the mills there is now no further supply of mill track, and it is practically superseded by the "brick" spawn. The real "mill track" is the natural spawn that has spread through the thoroughly amalgamated horse droppings in mill tracks, or the sweepings from mill tracks.

### Spawn Produced in a Manure Heap.

During the past year I have made some experiments in the pine and oak woods of Hynesboro' Park, Maryland, with relation to spawn culture, an account of which may prove of interest to students in this line of investigation. Several loads of stable manure and oak-leaf bedding were well mixed and formed into a mound about three feet in height, having a diameter of six feet, and tapering to about four inches in depth at the outer edge. The mass was quite moist and slightly tamped to give it general consistency. It was exposed to the open air, without protection, during the months of September, October, and November. In the meantime, frequent rains occurred. On examination it was found that the rains did not penetrate to a depth of more than four inches. On opening up the centre of the mound, it was observed that the portion thus exposed consisted of highly decomposed leaves, and presented a white mass of matted, "burned" mycelium. It was evident that the temperature at that point had risen considerably above 100° Fahr. The mycelium was, doubtless, produced in abundance before the temperature reached 100 Fahr. and became scorched as the temperature increased. On examining the outer edges, where the depth was only twelve inches, I found an abundance of mycelium which did not show any appearance of having been scorched by undue temperature. Since no mycelium had been added to the mound, it is evident that the spores which produced it must have been present, although unobserved, and awaiting only the proper conditions for development, *i. e.*, for budding and the production of mycelium. At the end of the third month, groups of the common meadow mushroom, Agaricus campestris, together with some fine examples of Tricholoma terreum, an edible mushroom, common to these woods, appeared on the edges of the mound.

# APPENDIX A.

## CONTINUATION OF GLOSSARY OF TERMS USED IN DESCRIBING MUSHROOMS.

*Maculate*, spotted.
*Marginate*, having a distinct border.
*Matrix*, the substance upon which a mushroom grows.
*Medial*, at the middle; of the ring of a mushroom which is between superior or near the apex of the stem, and distant or far removed from the apex.
*Merismoid*, having a branched or laciniate pileus.
*Moniliform*, contracted at intervals in the length, like a string of beads.
*Multifid*, having many divisions.
*Multipartite*, divided into many parts.
*Mycelium*, the delicate threads proceeding from the germinating spores, usually white and popularly termed spawn.
*Narrow*, of very slight vertical width.
*Netted*, covered with projecting reticulated lines.
*Nucleus*, the reproductive germ in the spore.
*Obconic*, inversely conical.
*Obcordate*, like an inverted heart.
*Oblique*, slanting.
*Oblong*, longer than broad
*Obovate*, inversely egg-shaped, broadest at the apex.
*Obtuse*, blunt or rounded.
*Ochrospore*, ochre-colored spore.
*Orbicular*, having the form of an orb.
*Order*, group of a classification intermediate between tribe and family.
*Ostiole*, *ostiolum*, mouth of the perithecium; orifice through which the spores are discharged.
*Ovate*, egg-shaped.
*Pallid*, pale, undecided color.
*Papillate*, *papillose*, covered with soft tubercles.
*Paraphyses*, sterile cells found with the reproductive cells of some plants.
*Parasitic*, growing on and deriving support from another plant.
*Partial*, of a veil clothing the stem and reaching to the edge of the cap but not extending beyond it.
*Patent*, spreading.
*Pectinate*, toothed like a comb.
*Pedicel*, foot-stock.
*Pedicillate*, having a pedicel.
*Pelliculose*, furnished with a pellicle or distinct skin.
*Penciled*, with pencil-like hairs either on the tip or border.
*Peridium*, general covering of a puff-ball, simple or double, dehiscent or indehiscent at maturity.
*Perithecia*, bottle-like receptacles containing asci.
*Peronate*, used when the stem has a distinct stocking-like coat.
*Persistent*, inclined to hold firm, tenacious.
*Pervious*, forming an open tube-like passage.
*Pileate*, having a cap.
*Pileoli*, secondary pilei; arising from a division of the primary pileus.
*Pileus*, the cap, receptacle, or one part of a mushroom; other parts are the stem and gills.
*Pilose*, covered with hairs.
*Pits*, depressions in cells or tubes resembling pores, applied also to hollow depressions in the surface of the cap of the morel.
*Plumose*, feathery.
*Pore*, orifice of the tubes of polypores.
*Poriform*, in the form of pores.
*Porous*, having pores.
*Powdery*, covered with bloom or powder.
*Projecting*, the anterior end jutting out beyond the margin.
*Proliferous*, applied to an organ which gives rise to secondary ones of the same kind.
*Pruinose*, covered with frost-like bloom.
*Pruniform*, plum-shaped.
*Pubescent*, downy.
*Pulverulent*, covered with dust.
*Pulvinate*, cushion-shaped.
*Punctate*, dotted with points.
*Pyriform*, pear-shaped.
*Quaternate*, arranged in groups of four.
*Receptacle*, a part of the mushroom extremely varied in form, consistency, and size, inclosing the organs of reproduction.
*Remote*, when the margin of the gill comes to an end before reaching the stem.
*Reniform*, kidney-shaped.
*Repand*, bent backwards.
*Resupinate*, of mushrooms spread over the matrix without any stem and with the hymenium upwards; inverted by twisting of the stalk.
*Reticulate*, marked with cross lines like the meshes of a net.
*Revolute*, rolled backwards; of the margin of a cap; the opposite of involute.
*Rhodospore*, rose or pink spore.
*Rimose*, cracked.
*Ring*, a part of the veil adhering to the stem of a mushroom in the shape of a ring.
*Rivulose*, marked with lines like rivulets.
*Rubiginous*, rust colored.
*Rufescent*, reddish in color.
*Rugose*, wrinkled.

## APPENDIX B.

Through the courtesy of Mr. Hollis Webster, Secretary of the Boston Mycological Club, the following list of mushrooms, which have been collected and eaten by members of that club during the past year, has been supplied to me :

AMANITA.

A. *Cæsarea* Scop., " True Orange."
A. *rubescens* Persoon.
A. *vaginata* Bull.

LEPIOTA.

L. *procera* Scop., " Parasol Mushroom."
L. *rachodes* Vilt.
L. *Americana* Pk.
L. *naucinoides.*

ARMILLARIA.

A. *mellea* Vahl, " Honey Mushroom."

TRICHOLOMA.

T. *equestre* L.
T. *sejunctum* Low, " Yellow Blusher."
T. *portentosum* Fr.
T. *coryphæum* Fr.
T. *russula* Schaeff.
T. *columbetta* Fr.
T. *gambosum* Fr., " St. George's Mushroom."
T. *personatum.*
T. *nudum.*

HYGROPHORUS.

H. *virgineus* Fr.
H. *fuligineus* Frost.
H. *flavo discus* Frost, " Yellow Sweet-Bread."
H. *hypothejus* Fr.
H. *puniceus* Fr.

LACTARIUS.

L. *piperatus* Fr.
L. *deliciosus* Fr.
L. *volemus* Fr.

RUSSULA.

R. *virescens* Fr.
R. *lepida* Fr.
R. *punctata* Gt.
R. *aurata* Fr.
R. *ochracea* Fr.
R. *alutacea* Fr.

CANTHARELLUS.

C. *cibarius* Fr.
C. *umbonatus* Fr.

MARASMIUS.

M. *oreades* Fr., " Fairy Ring."
M. *scorodonius* Fr.
M. *alliaceus* Fr.

HYPHOLOMA.

H. *sublateritium* Schaeff.
H. *candolleanum* Fr.
H. *perplexum.*
H. *appendiculatum* Bull.

COPRINUS.

C. *comatus* Fr., " Shaggy Mane."
C. *ovatus* Fr.
C. *atramentarius.*
C. *micaceus* Fr.
C. *fimetarius* Fr.

CORTINARIUS.

C. *turmalis* Fr.
C. *sebaceus* Fr.
C. *cærulescens* Fr.
C. *collinitus* Fr.
C. *violaceus* Fr.
C. *albo violaceus* Pers.
C. *cinnamomeus* Fr.
C. *cinnamomeus* var. *semi-sanguineus* Fr.

CLITOCYBE.

C. *clavipes* Fr.
C. *odora* Fr.
C. *dealbata* Low.
C. *laccata* Scop.
C. *multiceps* Pk.
C. *infundibuliformis* Schaeff.

COLLYBIA.

C. *dryophila* Bull.
C. *velutipes* Curt.

PLEUROTUS.

P. *ostreatus* Fr.
P. *sapidus* Kalch.
P. *ulmarius* Fr., Elm-tree Mushroom.
P. *pluteus cervinus* Schaeff.

CLITOPILUS.

C. *prunulus* Scop.
C. *orcella* Bull.
C. *unitinctus* Pk.
C. *Seymourianus* Pk.

PHOLIOTA.

P. *caperata* Pers., " The Gypsy."
P. *præcox* (when too old is bitter).
P. *adiposa.*

AGARICUS (Psalliota).

A. *arvensis.*
A. *cretaceus* Fr.
A. *campester* L.
A. *silvicola* Vilt.

SPARASSIS.

S. *crispa* Fr.

CLAVARIA.

(Any and all Clavarias found are generally eaten by us without identification).
C. *botrytes* Pers.
C. *amethystina* Bull.
C. *coralloides* L.
C. *cinerea* Bull.
C. *aurea* Schaeff.
C. *rugosa* Bull.
C. *pistillaris* L.

LYCOPERDON.

L. *cyathiforme* Bosc.
L. *giganteum* Batsch.
L. *pyriforme* Schaeff.
L. *saccatum* Fr.

MORCHELLA.

M. *esculenta* Bull.
M. *conica* Pers.

PEZIZA.

P. *aurantia* Vahl.

STROBILOMYCES.

S. *strobilaceus* Berk.

FISTULINA.

F. *hepatica* Fr., " Beef Steak Mushroom."

POLYPOROUS.

P. *betulinus* Fr. (coriaceous when old).
P. *sulphureus* Fr.

HYDNUM.

H. *imbricatum* L.
H. *repandum* L.
H. *caput-medusæ* Bull.

Also thirteen of the Boleti.