[Concluded from SUPPLEMENT No. 390, page 6235.]

CEREAL FOODS FROM WHAT WE EAT AND WHAT WE DRINK.

By Dr. A. T. CUZNER, Peekskill, N. Y.*

STARCH.

Starch, like sugar and fat, is a hydrocarbon represented by the formula $C_{12}H_{20}O_{10}$. It is probably the most abundant product of vegetation. It forms the great bulk of the tissues of most seeds and plants. When the pith of the sago palm is washed with water on a fine sieve, a white powder is deposited by the milky fluid that passes through. This, when collected, forced through a metal sieve to granulate it, and dried by agitation over the fire, is the sago of commerce.

When the raw potato is peeled and grated on a fine grater, and the pulp thus produced well washed with water, potato starch is obtained. When the roots of the Maranta crundinacea of the West Indies are grated and washed like the potato, they yield the arrow root of commerce. From the root of the manioc the cassava is produced by a similar process, and this, when dried by agitation on a hot plate, is the tapioca of the stores. In a solution of iodine they all become blue. Fig. 6 represents starch cells from wheat.

FIG. 6.

If we regard the enormous proportion in which the seeds of cereals and leguminous plants and the tuber of the potato enter into our dietary, and the immense percentage of starch in these articles, it is not exaggerating to say that fully two-thirds of the food of mankind consists of starch. Therefore its importance as an article of human food requires at our hands a more detailed consideration.

Starch, in the raw state, is to man an almost indigestible substance; but when subjected to the operation of cooking, it is readily digested. The digestion of starch in the human body is accomplished by the saliva and pancreatic juices. These are both rich in a substance called *diastase*, and owe their power of digesting starch to it.

DIASTASE.

Starch is likewise digested in plants by the same substance (*diastase*). Let us examine the process somewhat.

If we take barley newly malted and crushed, pour cold water on it, and let it remain for a quarter of an hour; if the water is now poured off, filtered, evaporated to a small bulk over boiling water, and then mixed with much alcohol, a white tasteless powder falls down. This is *diastase*.

If unmalted barley be so treated, no *diastase* is obtained. Therefore, this substance is formed during the process of malting.

If grains of wheat (which yield no *diastase* before germination) be made to germinate (or sprout) and be afterward ground and treated as above, *diastase* will be obtained. It is therefore the *product of germination*.

If a potato be made to sprout, and the sprout cut off with a small portion of the surrounding potato, and if we cut off the upper half and examine it as described above, we find no *diastase*. If we examine the mass of the potato from which the sprout was taken or detached, we find no *diastase*. But if we examine the lower half of the sprout with the small portion of potato attached, we find *diastase*. This substance is formed at the base of the germ during germination; but it is not found after the first true leaves of the plant are fully formed and expanded. What is the nature of the temporary function performed by *diastase* in the plant?

DEXTRINE.

If a certain portion of *diastase* be added to wheat, potato, or other starch in water, and be kept at a temperature between 120° and 140° Fahr., the starch will gradually dissolve and form a colorless transparent solution.

When this solution is carefully evaporated, a yellowish white powder is obtained, perfectly soluble in water, to which the name of *dextrine* is given.

Dextrine is merely starch changed, or transformed in such a way as to become soluble in cold water.

This change is similar to that which it undergoes by simply boiling in water.

GRAPE SUGAR.

But if the digestion be continued after the starch is dissolved, the solution will gradually acquire a sweet taste, and if it be now evaporated, it will yield, instead of *dextrine*, a mixture of gum and grape sugar. If the digestion be still further prolonged, the whole of the starch will be converted into *grape sugar*.

One part of *diastase* will convert into sugar 2,000 parts of starch.

FUNCTION OF DIASTASE.

We see by this, that one of the functions of *diastase* is to render soluble the starch, and so enable it to circulate in the sap of the plant. That it is the only one we have no reason to believe. In the human system the action of *diastase* is not limited to rendering starch soluble. In fact, it rarely has opportunity of so changing starch, for by the preparation food undergoes in cooking, starch is hydrated and rendered soluble in cold water. The function, therefore, of the *diastase* in the saliva and pancreatic juice is to change the hydrated starch into sugar.

Diastase does not exist in the saliva and pancreatic juice of young, suckling animals, except in minute proportion.

* A popular treatise on alimentary substances, by A. T. CUZNER, M.D., author of "Food Fishes of the United States," "The Cyclops," and other papers.

In the human infant, *diastase* does not appear to exist in sufficient abundance to digest starchy matters, until about the seventh month. Therefore, foods containing starch largely are unfit to administer to young infants.

From the above examination of wheat we find that it contains all the proximate principles that enter into the composition of the human body. This being the case, it follows that if we can retain, in the food manufactured from it, these principles in the same proportion (or nearly so) as exist in the grain, we shall have a perfect food, adapted to all the wants of the human system. Does the ordinary flour of commerce and the bread made from it contain them in the proper proportion? I answer, no!

WHITE FLOUR.

Fashion has decreed that flour shall be *white*. White flour means little gluten, and, as a consequence, loss of phosphates. By careful analysis of the husk or bran of wheat, we find it to be about 5 per cent. of the weight of the whole grain. Now, as it takes about 270 pounds of wheat to make a barrel of flour by the ordinary milling process, we have (or should have) a loss of but 13½ pounds; whereas, the actual loss amounts to between 50 and 60 pounds. Of what does this loss consist—what element of the grain is thus needlessly wasted? It is the *gluten*.

We have seen in our examination of a grain of wheat, that the principal mass of gluten lies between the bran and the starchy mass.

PROCESS OF MILLING.

When the grain is crushed between the mill stones, the layer of gluten sacs breaks up into fine scales which adhere firmly to the bran, but readily detach themselves from the crumbling starch. Part of these scales, by the continuous attrition of the burr, are torn from the bran and enter the bolting cloth, which from their irregular shape they pass through with difficulty, and much more slowly than the round granules of starch. But the larger proportion adhere to the bran and with it are separated from the flour.

DARK FLOUR.

I must caution the reader in this place not to understand us as teaching that because a flour is dark in color it must necessarily be good, and rich in gluten. Flour may be dark in color from various causes other than the gluten it contains. First, the wheat used may be a dark and impure variety. Second, shriveled or blasted grains, together with foreign seeds, may be ground up with good wheat, and so discolor the flour. Third, a large portion of bran may be ground and mixed with the flour, and discolor it. Therefore, while a dark flour may not necessarily be a good flour, we cannot have a very white flour containing much gluten; for it is the starch that constitutes its whiteness, while gluten gives its color. But it will be asked by the reader, if the above statements are correct, how is the average reader to tell the difference between two or more flours, their color being dark, as to whether they are rich in gluten and devoid of the outer bran coats or foreign coloring materials? I answer, it cannot be done without the aids of chemistry and the microscope.

BEST FLOUR.

I have been asked by quite a number of persons, "Is not the New Process Flour a perfect flour?" to which I have been compelled to answer, *No!* Now, while the Minnesota New Process Flour, as a white flour, is far superior to the average white flour of commerce, yet it is sadly lacking in the proper proportion of gluten. There are, however, several flours that can be obtained in the market that come near to what a perfect flour should be. Among these, the Franklin Mills Flour of the Entire Wheat, Lockport, N. Y., T. R. Beardsley, Mill Agent, 77 Warren Street, N. Y., stands pre-eminent. The following report of the Connecticut Agricultural Experiment Station, under the direction of Prof. S. W. Johnson, of Yale College, shows the difference between the New Process Flour and that of the Franklin Mills Entire Wheat as to the amount of gluten they each contain, and is decidedly in favor of the latter.

CHEMICAL ANALYSIS OF WHEAT FLOUR BY PROF. S. W. JOHNSON.

Minnesota New Process.		"Water Free," Franklin Mills Entire Wheat.	
Starch, sugar, etc.....	83.86	Starch, sugar, etc.....	78.46
Albuminoids.....	14.12	Albuminoids.....	16.20
Crude fiber.....	0.08	Crude fiber.....	1.39
Fat.....	1.37	Fat.....	2.30
Ash.....	0.57	Ash.....	1.65

The process adopted by the Franklin Mills is essentially as follows:

By improved machinery they remove from the grains of wheat the three outer bran coats and reduce the remainder to a fine flour. In this process they use no mill stones, therefore the flour is not heated during the process of manufacture. From the above analysis we find that the Franklin Mills Entire Wheat Flour, Lockport, N. Y., contains about 15 per cent. more gluten than the New Process Flour.

There is another flour (or rather meal, for it is not ground fine enough to constitute a flour) sold in the market that meets all the requirements of a perfect food. I allude to Mead's hulled wheat flour, manufactured by A. F. Mead, 10 Leonard Street, New York.

This meal is manufactured from a soft wheat after it has been perfectly hulled.

It is not bolted, therefore, all the constituents of the wheat are retained, excepting the three outer coats.

This meal shows well under the microscope.

The Arlington wheat is a pure Graham flour; it is rich in gluten, but contains the outer bran coats, and is, therefore, somewhat objectionable.

Having examined the structure, proximate principles, and the properties of a grain of wheat, let us now consider how this grain can be made available, in a most palatable form, for man's use as a food. In other words, let us consider the process of bread making.

BREAD MAKING.

There are two kinds of bread manufactured; the one is made with yeast, ferment or leaven, and is hence called leavened; the other is prepared without leaven, and is called unleavened bread.

The object of both processes is to render the dough, both before and during baking, light and porous. Now, in order that a porous structure in the dough may be obtained, it is necessary, first, that the flour should have a constituent which, when moistened with water at common temperature, shall possess two of the properties of India-rubber, tenacity and elasticity; and that these properties shall, in a great degree, be lost on subjecting the moistened flour or kneaded dough to a certain elevated temperature. Second, that an

agent be added that is capable, by the influence it exerts on the constituents of the flour, to cause them to take on such an action as shall result in the evolution of gas; this gas being generated in every part of the dough, in its efforts to escape distends it, and every part becomes cellular in structure. This structure is rendered permanent by the application of heat in baking. This agent is yeast.

YEAST.

The way yeast operates in the fermentation of flour is as follows:

When yeast is added to any substance containing sugar, it induces certain chemical changes, comprehended under the term vinous or alcoholic fermentation, the sugar being changed into alcohol and carbonic acid gas.

When yeast is added to flour (which we have seen contains sugar), it induces by its presence the sugar to change into alcohol and carbonic acid; the latter, in its efforts to escape from the dough, distends it, forming vesicular spaces in its interior, and so causing it to become porous and light.

The alcohol during the baking almost entirely escapes from the loaf. During the fermentation, a certain portion of the starch of the flour becomes converted by the action of the yeast into sugar, and in its turn is converted by the yeast into carbonic acid and alcohol.

During baking, part of the starch is converted into gum. We remarked, in a former part of this article, that flour of wheat contains a much larger proportion of *glutine*, or vegetable fibrine, than the other cereals. Now the property mentioned before, possessed by crude gluten of wheat, viz., that of elasticity and tenacity, and holding of gas bubbles, is due solely to the *glutine* it contains.

Other cereals which contain but a small percentage of *glutine* will not make light bread.

During the process of baking the bread, most of the yeast cells are destroyed by the heat; a few remain in the bread unchanged, and are capable of exerting their specific action when brought in contact with sugar in solution.

Some physicians are of the opinion that the presence of yeast cells imparts injurious properties to bread, and that like other fungi they produce injurious effects upon the human system. This is the writer's opinion.

The following appeared in the *Engineering Review*, London, England: "It has lately been proved that under certain conditions yeast may be a powerful poison."

"If introduced in suspension into the circulation of living animals to the extent of more than two grammes, it always produces fatal results; in smaller doses it induces coma."

"This is due to the fact that it multiplies in the blood, depriving the red corpuscles of their oxygen, and reducing their color to dark brown."

FUNGI.

The fungi belong to the lowest type of vegetable existence. They are for the most part microscopic in size. Unlike the higher order of plants, they are developed in darkness, and depend on decaying or decomposing organic matter for the material of their growth. They differ from flowering plants in their chemical influence upon the air. Like animals, they absorb oxygen, and give out carbonic acid. Besides organic decomposition, they require for their development a certain degree of heat and moisture in order

FIG. 7.—REPRESENTS YEAST FUNGI PENICILLIUM.

to their vegetative activity. They all contain a large percentage of nitrogenized matter, making their composition more analogous to animal matter than to the higher order of plants. Their growth and maturity are usually rapid, requiring often but a few hours. They are also equally rapid in their decay. The odors they emit are like those of animal matter. Their texture is woody in firmness. Each grows upon its own favorite place or soil. The yeast plant (*penicillium*) grows in such substances as furnish albuminoids.

The greatest sanitarian history gives an account of (Moses) forbade the Jews the use of yeast-ferment in bread made and used in their religious services. For further information in regard to the fungi that produce deleterious influence on the human frame, the reader is referred to the following articles by Dr. J. H. Salisbury, A.M.: "Something about Cryptogams, Fermentation, and Disease," *St. Louis Medical Reporter*, Feb., 1869; "Defective Alimentation a Primary Cause of Disease," *St. Louis Medical Reporter*, March and April, 1868; "Remarks on Fungi, with an Account of Experiments, showing the Influence of the Fungi of Wheat and Rye Straw on the Human System," *American Journal of Medical Sciences*, July, 1862; "Additional Observations, relating to the Influence of Fungoid Growth in producing Disease, and in the Fermentation and Putrefaction of Organic Bodies," October, 1862.

UNFERMENTED BREAD.

There are two kinds of unfermented bread. In one, substances are used (different baking powders) in place of yeast, from which a gas (carbonic acid) is evolved, distending the dough, and rendering it vesicular and light.

AERATED BREAD.

The other consists in charging water with carbonic acid gas, and mixing the flour in a close vessel with the water so charged, and baking the resulting dough.

The last process described above has all the advantages possessed by the other for making dough light and porous, without the disadvantage arising from the addition of foreign substance.

But there is one disadvantage attending the process, viz., it cannot be rendered available for domestic bread making.

BAKING POWDERS.

Among the many baking powders examined by the writer, the "America" was found to be the best.

In its mechanical operation of making the dough porous, it was found to be all that could be desired.

It is composed of an acid phosphate, ammonia, and Natrona soda. It adds to a white flour the phosphates lost in the milling process.

INDIA-RUBBER OR CAOUTCHOUC.

In consequence of the great demand of late years for India-rubber or caoutchouc, a considerable amount of attention has been given to discover or develop new sources of this useful article, some of which promise to be productive of valuable results. The time is not so very long since when India-rubber of commerce was obtained only from one plant, and that plant the *Siphonia elastica*, as it was then called, but which is now known as the *Hevea brasiliensis*, and which yields what is known in trade at the present time as Para rubber, a quality which holds its own for superiority over all others of the numerous sources from whence the elastic gum is obtained.

In consideration of the great and increasing value of India-rubber, it may not be out of place to sketch the history of the substance from its introduction into this country at the latter end of the last century. In the preface of a work treating on the art of perspective, published about 1770, we find the author thus speaking of that which is now an accessory to every inkstand: "I have seen a substance excellently adapted to the purpose of wiping from paper the marks of a black lead pencil. It must, therefore, be of singular use to those who practice drawing." The writer then goes on to state where it could be procured at that time, which was apparently at only one place in London, and the price was three shillings for a "cubical piece of about half an inch," which, he adds, will last for several years.

The form in which Para rubber was formerly brought to this country was alone sufficient to arouse a curiosity as to its origin. Caoutchouc made its first appearance among us in the well-known grotesque figures of birds and animals, which were not by any means true to nature. No information, however, could be elicited for several years as to its origin other than that it was a vegetable product. The first accurate information was obtained by a French geographical expedition, which, not confining its attention merely to the purposes for which it was organized, cleared up many other difficult points connected with natural history. These observers reported the discovery of great numbers of trees known to the natives as the *Hevé*, which yielded a large quantity of an elastic, gummy substance, identical with the caoutchouc which had been imported into Europe some years previously. The India-rubber of commerce is now, however, as we have before said, furnished by many plants totally distinct from each other, and though a great deal has been done of late to clear up the nomenclature of many of them, there are others still that are but imperfectly understood.

The Para rubber, which has been imported in such large quantities that the supply has been getting scarce for some years past, is furnished by *Hevea brasiliensis*, though several other allied species, such as *H. spruceana*, yield rubber more or less abundantly. Wallace tells us that the principal caoutchouc district lies between Para and the Xingui River, the trees being among the largest denizens of the neighboring forests. They average about 100 feet in height, and two or three feet in diameter. The tree bears a fruit about the size of a large walnut, divided into three one seeded lobes, which separate or split naturally when ripe. The seeds are mottled and shining on the outside, and are similar in shape and appearance to those of the castor oil, but much larger. They are said to be poisonous when raw, but quite harmless when boiled. The Macaws, however, devour them greedily in their raw state without experiencing any harm. The tapping of the trees and the collection of the caoutchouc have been so often described that it is needless to enter upon it here. In tapping, however, it may be remarked that the first wounds are always made at the uppermost part of the trunk, by which means the juice is drawn off down to the point of incision, after which another wound is made lower down and exhausted, and so on until the base is reached.

Perhaps the next most important of American sources of rubber is *Castilloa elastica*, a plant closely allied to the bread fruit tree, and known as the Central American or Guatemala rubber tree; then comes the Pernambuco rubber from an apocynous tree (*Hancornia speciosa*), an order which, besides producing Borneo rubber, has recently revealed many rubber yielding plants, not only in the East, but also in Africa both on the East and West Coasts. The Eastern plants are referred to species of *Willughbeia*, *Leuconotis*, and *Chilocarpus*, and the African to various species of *Landolphia*, the principal West Coast species being *L. ovariensis* and *L. florida*, which last species also extends to the East Coast, the other East Coast species being *L. kirkii* and *L. persiana*. The careful cultivation and distribution of any of these plants is a matter of great commercial importance, and we are pleased to direct the attention of planters to our advertising columns, where, among new commercial plants, those yielding India-rubber have a prominent place.

CRYPTOSTEGIA GRANDIFLORA.

Our readers will recollect that about three months ago, a gentleman from South India recognized a plant of this rubber-yielding creeper, growing in Mr. Christy's hot house, as identical with one he had raised from seed in his compound at Tuticorin, for the sake of its beautiful flower. It had thrived luxuriantly in poor sandy soil within a few yards of the sea, and spread so rapidly as to give some trouble in keeping it within bounds. It had never occurred to him before that it was of any economic value, but upon making the discovery above mentioned and obtaining from Mr. Christy directions for the collection of the juice, instructions were sent out to make experimental incisions in the stems of the plants, and to forward here for report and valuation specimens of the produce. These have now come to hand, and the result is most satisfactory and encouraging. The rubber is pronounced by experts to be clean, firm in texture, and of good quality, worth from 2s. 9d. to 3s. 3d. per pound. Now it is hardly necessary for us to point out the significance of these facts, or the wide field that is thus opened up for the profitable employment of capital and labor. There are thousands of acres of waste land in the low country of South India and Ceylon, where it is certain that the *Cryptostegia* will grow almost without any cultivation, and the original outlay would therefore be very trifling, as the land can be had for a nominal price, and all that is necessary seems to be the construction of a rude fence on

which the creeper could climb. It grows so rapidly that some return would probably be obtainable in the second year. The cost of collection is still an open question, but as the work could easily be done by boys and girls, and such labor is very cheap, there ought to be an ample margin of profit. We expect to hear before long of experiments on a considerable scale in both the countries named by us.—*Planters' Gazette*.

MUSK.

Musk is a secretion of the musk deer (*Moschus moschiferus*), which inhabits the alpine regions of the northern provinces of Thibet, and is also found in the southern borders of China and in Siberia as far as Lake Baikal. According to recent reports, it has been found in the provinces of Fohkien and Kiangsi, but does not seem to be hunted there.

The pouch that grows on the belly is about 2½ inches long, 1½ in diameter, and weighs about 30 grammes (over an ounce). It must be cut off as soon as the animal is dead, tied up, and dried. On the interior walls of this pouch is the musk, which looks like snuff, and which, if unadulterated, consists of smooth dry particles having a greasy feeling, is very friable, of a reddish brown color, and has the peculiar and unmistakable odor.

There are two principal varieties, Tonquin and Yunnan musk. The former comes from Thibet and Szechuen, the latter from the province of Yunnan, and both kinds find their way to Shanghai through Chungking and Lankow.

In addition to the ordinary Tonquin and Yunnan there is a finer grade of each distinguished by adding the term Taupi, thus Tonquin-taupi and Yunnan-taupi, which signifies the musk without the skin, otherwise the pouch is included. Both grades have an extremely fine perfume and bring a much higher price, but find little use in Europe. The odor is perceptibly different from the common ware, hence it might be supposed that they were derived from a totally different animal or came from another region.

A third sort is the Cabardine or Russian musk from Tientsin. Its perfume is not nearly so fine as that from Tonquin and Yunnan, and the loss from hair, skin, and moisture is much greater, hence its value is much less. Tonquin musk is the one chiefly exported to Europe and America. Cabardine musk is less esteemed there, and Japan is the principal market for the Yunnan musk. In the first half of 1882 Japan took 340 catties of this musk.

For some time past there has been a marked decrease in the quantity of Tonquin musk received. The Chinese dealers attributed this to the establishment of a protective law in the hunting section. This circumstance combined with active demand in London and a small supply on hand caused the price to rise from 71 or 72 taels per catty in 1881 to 120 taels in 1882. (The Shanghai tael is \$1.15, and the catty weighs 1½ lb. avoirdupois.) This hunting law is said to have been removed recently, but no change in price nor increase in receipts has yet been detected.

If some limit was actually put upon the musk hunting in Szechuen and Thibet, at all events Yunnan did not follow the example, for the receipts from this province are always abundant, so that the total export of musk seems but little less than last year. Independently from the fact that the price of Yunnan musk has followed that of Tonquin musk, the large production of the former has had little influence upon the business in Europe, where neither sort has increased in favor nor in consumption.

The Chinese firms that deal in musk have, as a rule, branch houses in the chief cities of Yunnan and Szechuen, and in Chungking, Zchang, and Lankow. They advance the money to the hunters upon the musk and thus prevent the article from falling into other hands than those of regular dealers. Every large musk firm has agents in Shanghai and Canton to look after the sales. In Shanghai there are only five "hongs" for Yunnan and Tonquin musk; they all live in the same neighborhood, and there is no competition between them, as they form a kind of monopoly.

The business in other articles of export is done by brokers, or middle-men, who are foreigners and who carry samples of newly received products around to their customers, but with musk this is not the case.

Here the buyers must seek some other means of informing themselves when a new "chop" comes in, and the musk dealers seek to secure themselves from being too quickly deprived of their wares. Musk is sold here only in the original chests of 10 to 30 catties (averaging 20 catties), or in whole "chops." The buyer does not have his choice of the individual bags, cannot divide a chop, but must either take the original consignment just as it comes from the interior, or refuse it all. There is no particular season for musk; it comes into the market at irregular intervals throughout the entire year. The Cabardine musk brought from Tientsin is sold by special "hongs."

The export of this drug will always remain within moderate limits, not only because the production is limited by nature, but also because the Occidental demand has as competitor the still stronger demand for home consumption. It is well known that in China everything smells of musk. Both sexes are accustomed to carry it with them in little boxes and to keep it in their clothes presses. While it is losing ground in European therapeutics, the cures attributed to it in China are very manifold, as may be supposed from their mythical nature.

When we consider that an export of 3,000 catties, each catty containing 15 to 20 pouches of Yunnan, or 20 to 30 of Tonquin musk, means the sacrifice of no less than 60,000 musk deer, and this quantity has been reached several times of late years, and then if we add to this the consumption in China itself, which can scarcely be estimated, we see that it is not too much to fear the entire extirpation of this useful as well as graceful animal. Hence it would be desirable that the before mentioned rumor of the legal establishment of a period of protection should be confirmed, even if the development of this branch of trade should suffer some in the immediate future.

The adulterations of this ware seem to be as ancient as the trade itself. Du Halde mentions it as being very common and refers to pulverized rotten wood as one of the ingredients; and he also speaks of artificial pouches with which they avoided the law then in force against selling musk to foreigners. At present really pure musk scarcely comes in the market at all. Even the best chops do not contain more than 50 or 60 per cent. of genuine substance, and on the average we must be satisfied with about 30 per cent.

The adulterants of musk are generally coagulated blood, a fatty ether (or oil), paper, hair, pieces of leather, etc., which are introduced into the bags so skillfully as to require a sharp eye and years of experience to be able to detect it. It is not customary here to make any chemical test; the musk inspector takes out a little of the substance with a silver needle, notices its odor, and estimates its value. The

pods or bags are immediately assorted according to the percentage of adulteration that he thinks he has discovered in it, and put in piles called 1, 2, and 3, for the European or American market, where this classification is frequently changed and others substituted.

Each pouch is then wrapped in Chinese paper and put in a pasteboard box lined with lead, and covered with silk. Each of these boxes contains a catty of musk; they are finally put in a wooden box lined with zinc. These boxes are of different sizes according to the size of the chop to be packed. They are generally shipped by the mail steamers, being placed in the safe reserved for bullion and treasure. These precautions are necessary on account of the high price of the goods as well as liability to evaporation. The ships of the old East India Company are not allowed to take any musk on board.

The total export for the last five years was 25,664 catties, or 33,875 lb., valued at \$2,728,800. The chief port of export is Tientsin; Shanghai and Canton export very little.—*From the Report of the German Consul-General in Shanghai.*

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