

XXXI.—MR. CHRISTIAN WAGNER'S ESTABLISHMENT FOR RAISING GOLDFISH, AT OLDENBURG, GERMANY.*

The two most important establishments for raising goldfish in Germany and Austria are the one belonging to Baron Max de Washington, of Poels, near Wildon, Styria, and the one belonging to Mr. Christian Wagner, of Oldenburg, of which we intend to give a brief description.

As the method followed in Oldenburg cannot be understood without some knowledge of the location of the establishment, we must mention that its 120 ponds are all close together, and with their dikes, &c., cover about 12 acres of bog-land near the river Hunte. The water, however, does not come direct from this river, but partly from an artificial stream or canal which on two sides forms the boundary of the establishment, partly from a neighboring factory, and from the ponds themselves. A glance at the accompanying diagram will best show what may be called the veins, arteries, and other vital organs of the establishment.

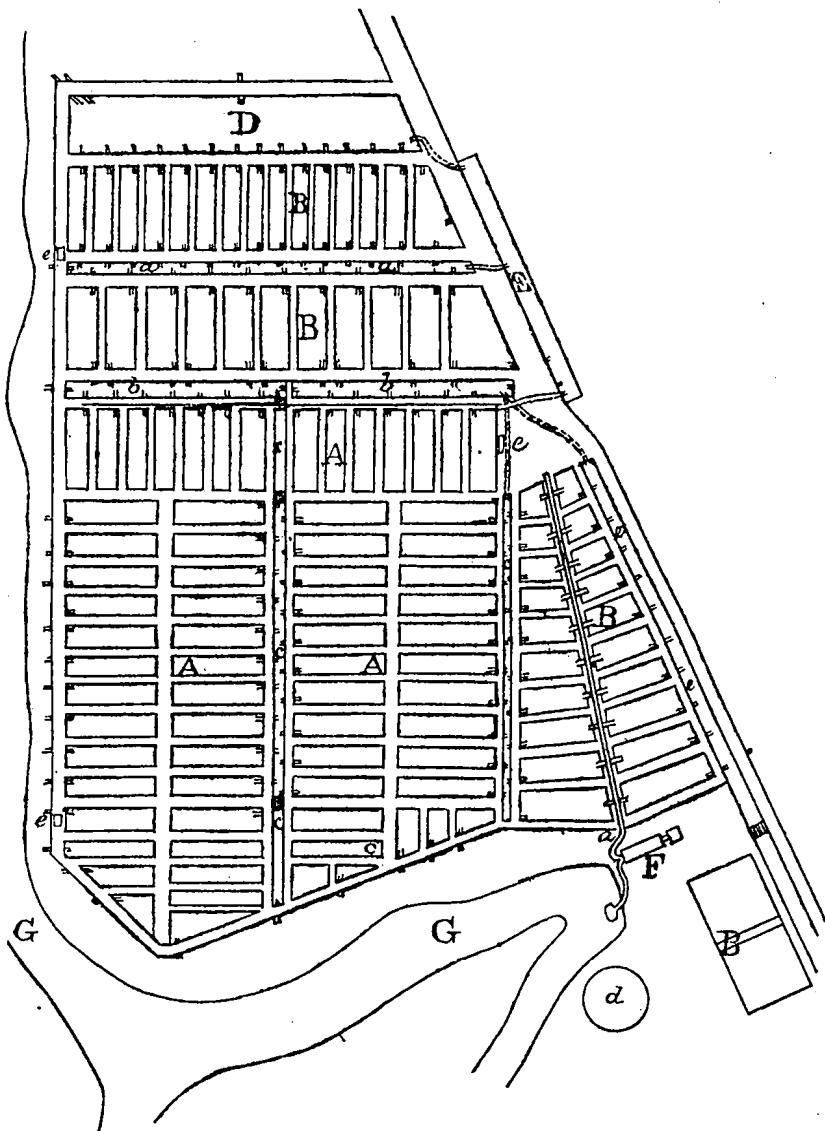
We intend first to show the manner in which the three channels which supply the water are used. The water which comes from the artificial stream G is, by means of the injector F, pumped into the open channel *a*, and after it has flowed through some or all of the ponds to the right and left it goes through wooden pipes into the ejecting-canals *c*, on each side, and eventually returns to the stream by way of the main ejecting-canal *b*.

In order to furnish the necessary insect life to the water which has thus circulated through a portion of the establishment, it is led by a very circuitous route before it again reaches the injector, and mingles freely with the main stream of the river, which is fed by the drains from the neighboring meadow-lands.

The water from the factory (which recently has proved very injurious) is collected in the reservoir E, and from there flows through subterranean pipes (indicated by dotted lines) into the channel *a*, which feeds the hatching-ponds B, and then goes into the flat "coloring-pond" D. After having mingled with the spring-water of these ponds it leaves the establishment, either through pipes laid in the dike of the pond, marked D, or through the main ejecting-canal *b*. Its temperature (sometimes as high as 100° Fahrenheit) cannot be regulated by Mr. Wagner as well as that of the water which is pumped in, and which, during the warm season, is sometimes raised to a temperature of 123° by means of the steam from a 10-horse-power engine.

* "Die Goldfischzuchterei von Christian Wagner zu Oldenburg." [From "Deutsche Fischerei-Zeitung," second year, No. 29, Stettin, July 22, 1879.] Translated by Herman Jacobson.

The water which comes from springs at the bottom of the ponds is chiefly used for supplying the different spawning-ponds, marked A, and the ponds for hardening the skin of the fishes ("*Hauthärtungs-Teiche*"),



PLAN OF THE OLDENBURG ESTABLISHMENT FOR HATCHING GOLDFISH.

A, A, A. Spawning ponds. B. Rearing ponds. C. Ponds for skin-hardening (?). D. Shallow coloring pond. E. Reservoir. F. Injector and machine-house (contains an engine of ten-horse power, which is connected with a machine of three-horse power). G. Artificial stream or canal. a. Open supply pipes. b. Principal discharging canal. c. Waste-pipe leading into A. d. Eel pond. e, e. Tool-houses.

N. B. The dotted lines, as also the short parallel lines, indicate covered pipes.

marked C, for although the spawning-ponds are, by subterranean pipes, connected both with the reservoir and with the hatching-ponds near the

machine-house, these pipes are but rarely used. In case of necessity, *i. e.* when the stagnating spawning-ponds require it, a movable wooden pipe is used, through which the water of the stream is pumped into every pond whose water needs stirring up. On its way the water becomes completely saturated with oxygen, and its effect on mature fish is so quick that they often commence to spawn within an hour from the introduction of the fresh water.

As the bottom of the dikes is composed of very porous soil, the water goes from one pond to the other, and the depth of water is about the same in all the ponds, any superfluous water being led out through the channels *c* into the main outlet-canal *b*.

Although at times the depth of water in the ponds is only $\frac{1}{2}$ foot, the average depth is about 2 feet, increasing to 4 feet near the outlets. The extent of surface is of greater importance than the depth of water, the average surface of each pond being about 228 square yards.

The bottom of the ponds is purposely left uneven, and is here and there overgrown with aquatic plants, on which the goldfish love to deposit their eggs.

The dikes between the ponds are generally 6 feet high, while the outer dikes are 8 feet high, 10 feet broad at the base, and 3-4 feet at the top. As the incline is therefore very gradual, and as the grass tends to keep the soil together, the bottom of the dike, though porous, is nevertheless firm.

The chief results of Mr. Wagner's cultivation of goldfish during several successive seasons are as follows: Many fish commence to color at the end of the first year; they are large enough to be sold for aquaria in the autumn of the second year, and they may be made to spawn two or three times a year, as a large number reach their maturity when only twelve months old.

By good feeding and frequent redistribution of the female fish (not allowing the same males and females to be together any very considerable length of time), and by an occasional airing of the water as described above, it has become possible to fix the time of spawning to the very day, and to raise a large number of young fish from comparatively few spawners. Under favorable circumstances the first young fish are raised in March or April, and by adopting the above-mentioned measures a second set of young fish may be raised in July or even earlier, and a third in August or the beginning of September.

It is but natural that fish cannot spawn so often during one season and at so early an age without many of them becoming prematurely barren. These barren fish, which can easily be recognized by a sunken appearance of the parts back of the ventral fin, must of course be separated from the others. They can only be sold as ornamental fish. Even if the spawning process is not hurried too much, it is an exception if a fish is used for spawning more than three years.

Mr. Wagner's average spawning stock amounts to about 3,000 fish,

which are continually improved by the introduction of Italian and Portuguese fish, and by adding the finest specimens which he raises every year.

Of fancy fish his ponds contain, besides a few peculiarly colored specimens, the "dolphin," the "head," the "double tail" or "narwhal," and the "telescope-fish." Whenever Mr. Wagner wishes to produce some new fish, he makes some of these monstrosities interbreed, and thus obtains novel specimens.

Although there is no fixed rule, the proportion of females to males in the spawning-ponds is generally as 2 to 1; in sorting them great attention must be paid to their quality, age, &c.

It is likewise important, not only with regard to the old but also to the young fish, that (excepting the winter months) they are properly sorted and distributed, so that fish of the same size are put together, and that sufficient and suitable insect food is supplied for those ponds in which the fish are placed when coming from the spawning-ponds. In order to secure this food the fish are generally placed in ponds which have laid dry for seven or eight weeks; and if it should happen that one or the other of these ponds has less food than usual, it can easily be supplied from one of the neighboring ponds, or in case of necessity from the artificial stream G by applying a double hand-pump.

On this stream depends the supply of water for the twenty hatching-ponds near the machine-house; the suction-pipe of the injector rises or descends according to the depth in which infusoria and other insects are found in the stream. In calm weather they are generally found at or near the surface, and farther down during windy weather. Their exact place of sojourn can always be ascertained by dipping a glass cylinder vertically into the stream, and by observing their position in the column of water.

The insects, however, are not alive when they become food for the fish. Before they reach the twenty ponds they have been killed by the heat of the water—which in summer is often raised to a temperature of 100° Fahrenheit by steam from the boiler. Not satisfied with the effect of the heat—in high temperature fish breathe oftener and consequently take in more food—and this system of what may be called "condensed insect-feeding," Mr. Wagner finds it beneficial to supplement this natural food from time to time with artificial food, using for this purpose blood, small pieces of meat, and occasionally barley which has commenced to germinate (refuse from breweries). This food is not cooked, but simply thrown into the ponds (the blood in small lumps) wherever the water is shallow.

The results of this Oldenburg feeding system, as regards the growth of the fish, are as follows: Some of them double their weight in a week's time, and under ordinary circumstances the young fish have reached a length of $1\frac{1}{4}$ to $2\frac{3}{4}$ inches in autumn. When properly colored the largest are then sold as "glass-fish." Most of them, however, do not reach a salable size till the end of the second summer.

The artificial coloring of the fish is just as important as their artificial feeding, and much time and money has been consumed in experimenting until satisfactory results have been obtained. The Oldenburg ponds are very favorably located with regard to the coloring process, for of the three principal ingredients, viz, iron, lime, and tan, the first mentioned is found in considerable quantities, both in the soil and in the water; nevertheless it is not sufficient, and has to be artificially increased from time to time.

The German national colors are in great demand, and a fish which was originally red and white can by proper treatment be transformed into an "imperial fish," exhibiting the national colors, viz, black, white, and red. In spite of the greatest care it will happen that fish are not sufficiently colored when they have reached the size of "glass-fish"; they are then transferred to the large shallow pond D, where they are more exposed to the rays of the sun, which possess a strong coloring power, but are not without danger to the fish, as they often kill them suddenly if the bottom is too bright and shadeless.

In order to make the fish less tender for handling and transferring to the aquaria they are generally for a time placed in the so-called "skin-hardening" ponds, marked C. The peat bottom of these ponds contains little or no sand or clay, but a great deal of iron. The water, likewise, contains much iron; and in ponds of this kind the adding of lime tends to harden the skin of the fish. This method of hardening the skin has made the former slow and wearisome acclimatizing process almost superfluous. By applying lime the same result is obtained with young eels, which are kept in the pond marked *d*, and are also sold for aquaria. These eels are obtained from neighboring waters, into which they come from the Hunte when they ascend that river in May.

By this simple method the goldfish become so hardened that they can be easily handled without suffering injury. Their future welfare (when kept in glasses or aquaria) of course depends on the character of the water and the food. Mr. Wagner recommends spring or pump water, and wherever this cannot be obtained river-water. Rain-water he considers utterly useless. When the goldfish are kept in glasses or small aquaria animal food is almost exclusively recommended by Mr. Wagner; *e. g.*, meat, raw or cooked, scraped very fine, worms, insects, larvæ, ant-eggs, &c. The aquaria should also contain a few aquatic plants at which the fish may nibble. Too much food is injurious, especially in winter, when scarcely any food is required. Mr. Wagner considers it less injurious to give no food for a whole month than too much food. As a rule, no more food should be given than can be at once consumed by the fish.

Before Mr. Wagner ships fish to any considerable distance he lets them fast for a week, and in this way prevents, as far as possible, the water from becoming impure during the journey. The vessel which is generally used for transporting goldfish is an oval tub with a perforated

bung at the top. As this tub is not completely filled with water, a certain degree of motion keeps the water pure and fresh, and in favorable weather—cold weather is the best—fish have successfully been sent to Denmark, Russia, England, Southern Italy, America, &c., without a change of water. The journeys are generally not very long, as most of the fish are sold in Germany and Austria. The risk and the difficulties of transportation are therefore considerably diminished.

The price of fish of course varies according to age, size, color, and kind. The most expensive fish are the so-called "telescope-fish," which are sold at \$7.14 to \$21.42 a pair; next come the "dolphins" and "heads," which sell at \$11.90 a pair; then the "double-tail" or "narwhal," which are sold at \$4.76 to \$2.85 a pair; and finally those fish which are valued on account of their peculiar coloring; these are sold at \$2.30 to \$23.80 a hundred.

In order to keep up with the constantly growing demand, Mr. Wagner has been obliged to increase and enlarge his ponds from time to time, and a number of ponds which were originally destined for carps have been appropriated for goldfish. In 1874 Mr. Wagner had 56 ponds and raised 99,500 fish; in 1876 he raised 170,000 (50,000 of which he exchanged for imported fish); and in 1877-'78 he had 120 ponds and annually raised 300,000 fish.

That the *Cyprinus auratus* does not bear its name in vain, but produces a golden harvest for its cultivator, is sufficiently proved by the fact that Mr. Wagner has been obliged to constantly enlarge his establishment. At the present time he employs a bookkeeper, a night watchman, an attendant, and fifteen laborers (not counting the men employed in the Berlin salesrooms), all of whom earn a good living, while his own annual profits are very considerable. The same area used for agricultural purposes would scarcely feed a single family.