AQUARIUMS FOR AMATEURS.

One would scarcely believe it possible to keep such a beautiful collection of plants and living creatures in the household as is shown in the accompanying illustration; but this is an exact representation of an aquarium belonging to Dr. Karl Russ, to whose article in the *Neue Illustrirte Zeitung* we are indebted for the following:

A consideration of the subject will show that, aside from the few who are interested in fish culture from a scientific standpoint, amateurs soon tire of their aquariums, and their collections end where they began. This, we think, is the fault of those who first introduced room aquariums, and who had either very little experience or too many prejudices, one of the worst of which was the idea that the fish must have fresh water once a day or once a week. If this system were carried out, it would soon render life a burden to the occupants of the tank as well as to its owner. The chief requisite for the preservation and beauty of an aquarium is a luxurious growth of plants in the same, for only under such conditions can the fish live and thrive.

It is well known that the tank should be rectangular; a round tank is as bad for fish as a round cage for a bird. The bottom should be covered four or five fingers deep, the deeper the better, with carefully washed sand, and over this should be scattered all kinds of shells, pebbles, bits of coral, etc. These are ornamental, and will also help to keep the sand in place. In the center or at one side, there should be a rockery to serve as a hiding place for the fish, etc. Calcareous rock is the best for this purpose. After all this has been arranged the water should be poured in carefully, filling the tank to within two or three inches of the top, and then it should be allowed to stand for about a week. After the sand has settled and the water is perfectly clear, the plants can be put in it. Then we shall have a perfect aquarium ready for the fish, etc. As the water evaporates, it should be replaced from time to time, keeping the level the same. The fish can be selected to suit the taste and judgment of the owner.

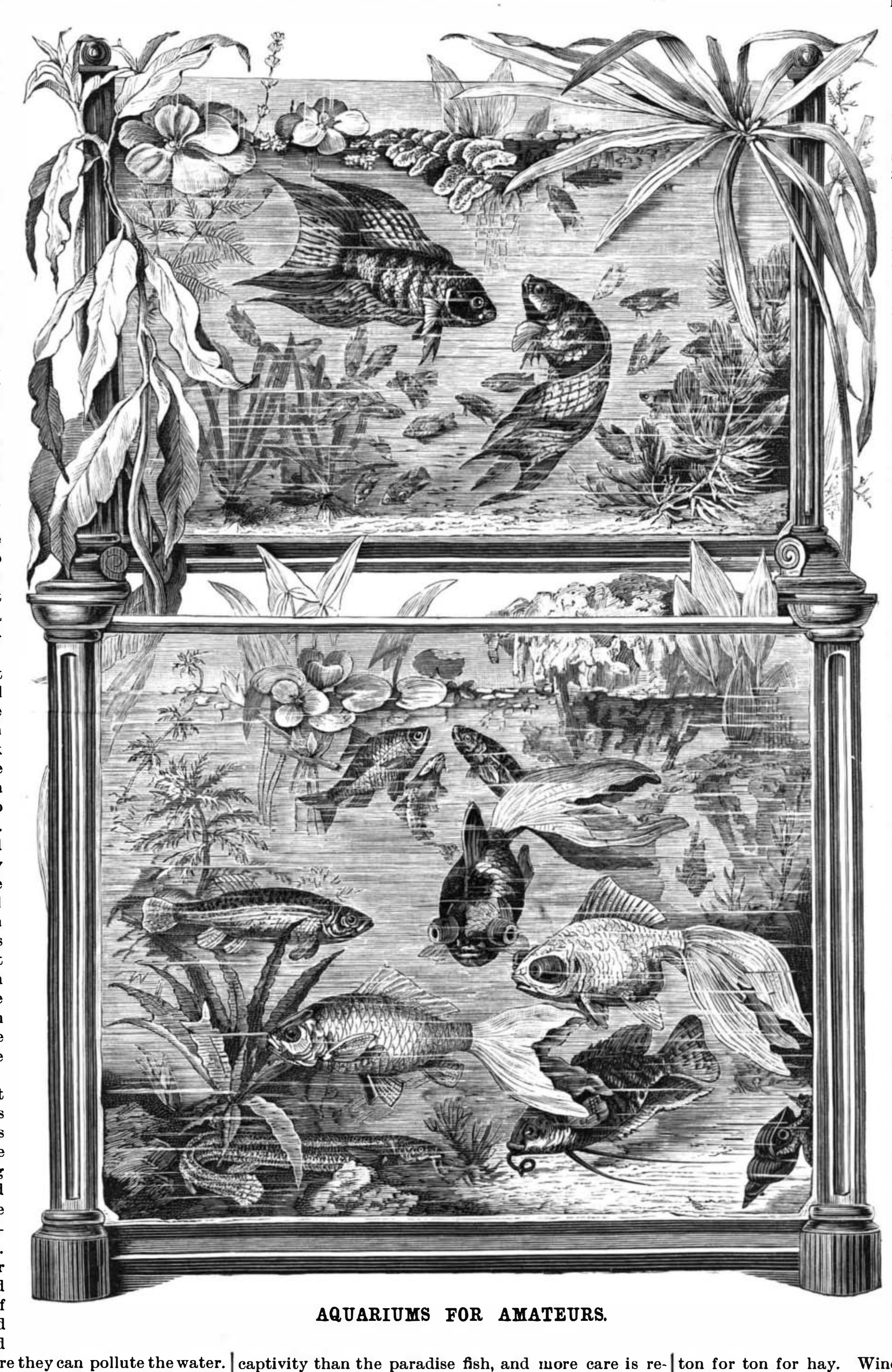
There really is no limit to the wealth of plants which can be used for this purpose. Many can be found in the neighboring streams, ponds, and swamps, and innumerable foreign plants can be obtained from florists. There are the floating or swimming plants, and those with roots, all of which must be watched carefully, dead leaves and stems being removed before they can pollute the water. After the plants have begun to thrive, if the water has no bad odor, the aquarium can be stocked with fish, but the choice of the latter must depend upon the object of the owner, whether he wishes to use his tank for breeding purposes or designs it simply for his own pleasure and amusement. In the former case, the fish must have a certain amount of shelter and quiet, and the young must not be exposed to destruction by other occupants of the aquarium. The reader may be surprised that I should speak of breeding fish in the home, but it can easily be done, and one of the best fish for this purpose is the Chinese paradise fish (*Macropodus venustus*). It has been a great favorite with amateurs of late years, and bids fair to become as familiar a sight in the household as the canary. A tank holding a cubic foot of water will answer for a paradise fish, though, of course, the larger the better. These beautiful, brilliantly colored fish begin to spawn in June or July. The male makes a nest of mucus, and in this the eggs are deposited. As soon as the young fish begin to swarm from the nest, the old ones should be removed to another tank, where they can give all their attention to the second brood, and so that they will not devour the first brood. I have found, however, that the young live perfectly well, in many cases, when left with the parent fishes.

Another fish which can be recommended for breeding purposes is the stickleback, which, like the paradise fish, builds a nest in the aquarium, but instead of building it of mucus, uses vegetable fibers, etc., much as birds do. The stickleback is more difficult to keep in captivity than the paradise fish, and more care is required.

This fish culture is, on some accounts, rather difficult, and an easy way is to obtain eggs from breeders, and hatch them in the aquarium. Eggs of the carp, gold fish, etc., can easily be hatched in this manner, specially if a canal or small stream is available for the purpose, and the amateur can gain much pleasure and amusement as well as valuable information from such an undertaking.

For an ornamental aquarium, such as is shown in the cut, fish should be chosen that will give variety of form and color, and the plants should be abundant, and frequently renewed, for gold fish and many others live partly on the plants, destroying their roots.

The fish should be fed on the pupæ of ants and other insects, worms, and fresh, raw, lean, and finely chopped meat, and only as much of one of these things should be given at a time as will be eaten. To avoid having uneaten bits left to pollute the water, a number of snails should be kept in the aquarium, care being taken that the number shall not be too great, for the snails destroy the roots of the plants. When there are pike, perch, or other fish of this kind in the aquarium, they should be supplied with small whitefish and other young fish which can be obtained of dealers, and which are used only as food for the larger fish. In the summer, water flies and other small creatures should be caught in neighboring ponds and streams, and put in the aquarium. But the fish should never be fed with crackers, white bread, seeds of plants, or food different from that mentioned above.



AQUARIUMS FOR AMATEURS.

California Fruit.

The growth of the California fruit trade continues to be marvelous. A Fresno firm, says the *Graphic*, sends East this year about 300 car loads of raisins. It is only about ten years since the first experiments in raisin packing were made. The grape used had long been known, however, as the "raisin grape," and it continues to be the favorite for that use. It is a white grape, and grows in comparatively small bunches, and the skin is so tender that a bunch may be bruised into jelly by merely shaking it, the skins breaking by contact with each other. It is very delicate in flavor as well as texture, but, like most of the choicer varieties, is, of course, much too frail for any kind of shipment yet discovered. Very few varieties of the California grapes are sent here. Over two hundred are commonly grown there, and there is such a vast variety among them that they are often like entirely different species of fruits.

The making of wine has also only been brought to any degree of excellence within less than ten years, but in that time California wine has made an immense impression on the market. The grape used almost altogether for wine is called specifically the "California grape," or sometimes the Mission grape, because it was introduced into the country by the first Spanish missionaries, and was grown to a large extent before any American settlements were made. It is not known from what stock it came, so distinctive has its character become. It is individually small, but the bunches are immense, from six to ten pounds, and in exceptional cases much more. The wine is very prolific. The time is not far past when this grape was such a drug in the market that some seasons it would be exchanged ton for ton for hay. Wine making has changed all that now, however.

The Lowest Record in Working Gold Ores.

When gold ore can be mined in California for 37½ cents a ton, and milled for 23 cents per ton, it is getting the business down to a very fine point, and augurs well for the future of California quartz mining. And this has just been accomplished—not with a small test run of 20 or 30 tons of ore, but with nearly 3,000 tons. It will astonish many persons to learn that ore worth only $1 16 per ton can be moved and worked without loss, and still more surprise them to know that ore of that value is paying about 56 cents per ton profit.

This record was made recently at the Spanish mine, Washington Township, Nevada County.—*Min. and Sci. Press.*

Niagara Falls Water Power.

About six months ago, Mr. James B. Stafford, of Buffalo, N. Y., in connection with others, offered a large prize of $100,000 in money for a contrivance that would convert the flow of water in Niagara River into practical power.

The prize has not yet been awarded, nor has any fixed standard of efficiency been determined upon, although many plans have been received. The various contrivances will, it is said, be placed on exhibition as soon as the $100,000 committee are satisfied that the subject has been exhausted. The prevailing opinion, as ascertained from the inventions offered, appears to be that the mighty river must be set to work by means of a current wheel, or by some modification of it.

Recently the Buffalo papers announced that a practical test was to be made of one of the contrivances. The inventor has conceived the idea of catching the force of the current on paddles fixed on an endless chain, the whole to be sunk in the river so as to be below the ice in winter, the freezing over of the stream being an apparently insurmountable obstacle in the way of a surface current wheel. The paddles or buckets on the proposed chain are to be attached by hinges, so to speak, so that they will be perpendicular to the current when passing down stream and parallel with it when returning up stream. The construction is thus similar to that of "feather" paddles on a steamboat. The endless chains communicate the power of the current to wheels over which they pass, and by shafting to practical machinery. This submerged oblong current wheel is geared upon a float which is sunk to the bottom of the river, or to a required depth, and there securely anchored. Having air-tight compartments, it can be raised when desirable by pumping out the water.

These experiments for obtaining power at Buffalo are not favorably regarded by some practical men as compared with the other project now in hand at Niagara Falls.

In view of the fact that the level of the great river at the head of the rapids is, in round numbers, 200 feet above its level at the foot of the cataract, Mr. Evershed proposed to bore a tunnel from the lower level to a point coinciding with the upper level. Starting at the base of the precipice below the falls, the tunnel, which it is proposed to make twenty-four feet in diameter, it is proposed to construct directly under the village, and to follow the line of the shore above the falls at a distance of about 400 feet from it. At a distance of one mile the tunnel will be 124 feet below the surface, at a mile and a half 97 feet below the surface, at two miles 85 feet below, and at two and a half miles 76 feet below. Now, this tunnel is not for the purpose of conveying water to water wheels, but solely for carrying it away from such wheels. It is to be a tail race simply. The mile point, where the subterranean tail race is 124 feet below the surface, is beyond the limit of the State reservation, above the rapids and coincident with the safely navigable water of the river. From this point along the river as far as the tunnel may be extended—the present plans providing for only a mile and a half—the water power will be available by sinking shafts from the surface to the subterraneous tunnel or tail race, and planting turbine wheels at the bottom of them, geared by upright shafting to the machinery of mills or factories. The "head" or height of fall down the first shafts at the mile point of the tunnel will be 124 feet, the wheel pit being at that depth below the surface; at the mile and a half point the "head" will be 97 feet, and so on, the average head for the mile and a half provided for in the present plans being 120 feet. The water is supplied by conduits from the river, and transverse tunnels for wheel pits and tail races are to be cut corresponding with the surface conduits, thus enabling mills to be erected not only along the line of the main tunnel, but on these transverse conduits.

The financial possibilities of the undertaking remain to be wrought out. In 1886 the legislature granted a special charter to a company of gentlemen of Niagara Falls and elsewhere, with a nominal capital of $200,000, with power to increase it to $3,000,000. The engineer's estimate of the cost of constructing the main tunnel, twenty-four cross tunnels, four shafts, twelve feed raceways or conduits, and other necessary works is $2,250,000. The land plan of the company is to grant mill rights on lands which they have already acquired or stipulated for, along the river at the head of the proposed tunnel, at a nominal price, practically giving them away, and to depend upon rentals of power for returns on the investment. The entire plant as covered by the $2,500,000 estimate of cost will develop 119,000 horse power, or 238 mills and factories of 500 horse power each. The present financial plan provides for renting this power for $10 a year per horse power for twenty-four hours a day, it being taken for granted that the supply of water might as well be for every hour as for less, since there will never be any need for economizing. This is only half the rates paid by mill owners for water power at Cohoes, Holyoke, Lawrence, and Lowell, while at each of those places the time is limited to eleven hours a day. The promoters of the Niagara Falls enterprise claim that they will be able to furnish the simplest, most abundant, and cheapest power in the world. They are delayed by some financial complications which they expect will be removed at an early day. So says a correspondent of the New York *Evening Post*.

But if the developments of natural gas progress in the future as much as they have in the past, water power will not prove so advantageous after all. In some of our Western towns they are offering to supply manufacturers who will locate there, the free use of gas for fuel both in their factories and homes. Thus the settler may obtain light, heat, and power in unlimited quantities for nothing. This beats Niagara cheap water power all out.

Methods of Distributing Natural Gas to Consumers.

BY WM. D. HARTUPEE, MANAGER CHARTIERS VALLEY GAS CO., PITTSBURG, PA.

Explosions have occurred in the past with natural gas that have been attended with loss of life and destruction of property, but the greatest number and most disastrous occurred when the business of conveying the gas was comparatively new, and each explosion was clearly traced to a cause which, in almost every case, was due either to defective valves, tees, elbows, and the general fittings that were put in the main lines, or to the fact that these fittings were too light to stand the work required of them, added to which was the fact that sufficient care was not exercised in putting the work together.

But the gas companies have made great changes in their methods of procedure since these accidents occurred. All the fittings used are made enormously heavy; complete systems for carrying away any escaping gas have been adopted; more skillful men are employed, and more care is exercised in the general supervision of the lines and different connections to prevent, to discover, and to repair leaks. In short, everything has been done by most of the companies that foresight or ingenuity can suggest to render the conveying of this subtile fluid safe and free from accidents.

The recent explosion was the result of carelessness—carelessly neglecting to shut off the gas while making a connection. It was surely carelessness, that surprises the other gas companies themselves more than it does the public who are unacquainted with their rules, for they have long since forbidden such risks to be taken.

All the gas companies, we believe (with the exception of the People's Gas Company, which seems to be a law unto itself), that are producers as well as distributers of natural gas for these two cities of Pittsburg and Allegheny, are working under council ordinances which regulate the pressure to be carried and the way the pipes are to be laid. The gas is carried from the wells (generally in wrought iron pipes tested to stand a pressure of at least 500 pounds, and sometimes as high as 1,000 pounds) to the city line at a high pressure. At or near the city line the gas is passed through automatic regulating valves, and the pressure is reduced to that specified by the city ordinance. It then flows into much larger pipes (in order to make up in volume what the gas has lost in pressure), and is conveyed through the city. The pressure which is carried in the city is about fifteen pounds to the square inch, and the lines which carry this pressure we call our "mill supply lines," to distinguish them from our house supply lines, of which we will speak later on.

Upon every line of this character within the city limits, the Chartiers Valley Gas Company places their patented escape system for conveying away any gas that may leak out at the joints, that has been pronounced by many experts as more efficient than that used by any other company, and has been recommended by visiting natural gas committees from other cities after thoroughly examining all the other devices in use.

Our system consists simply in placing a sleeve over every joint in the gas line, first seeing that our joints are absolutely tight under pressure, and having them passed upon by the city inspector. This sleeve is made perfectly gas tight around the pipe, by means of lead or other suitable material. On the inside of the sleeve a space or chamber is left, so that any gas that escapes from the joint on the main line is collected in this chamber. Connected with this chamber at the top, a small pipe leads off and up into a lamp post situated at the curb. Each joint has its own separate and distinct escape pipe, and several escape pipes may be run into one lamp post. Each joint is numbered, and its exact distance measured from the lamp post.

The escape pipe that leads away from the joint is marked with the corresponding number at the top of the lamp post, so, if gas is found escaping at the top of the lamp post, by noting the number of the small pipe through which it escapes, the exact location of the leak can be determined.

In addition to this "patented separate pipe escape system," as it is called, the Chartiers Valley Company takes the further precaution of covering all its pipes with broken stone for a height of nine inches above the main, and at every 90 or 100 feet leading this broken stone by means of a cross ditch to the foot of a lamp post, so that any gas that escapes from the body of the pipe would find its way through this "French drain," and through the lamp post into the open air. Before the ditch is filled, a double layer of tarred paper is placed over the broken stone to keep the dirt away from it. (This broken stone system is also patented and controlled by the Chartiers Valley Gas Company.)

With such a system we believe that it is impossible that any escaping gas would find its way into cellars or sewers, for, with a free, uninterrupted opening into the air, it would invariably seek that course in preference to any other, in addition to which the lamp posts create a draught that tends to draw the leaking gas away from the line.

A gas company's "house supply system" deserves especial attention, for while the "mill supply system" of any company covers but a comparatively small part of the city, the house supply lines are laid on almost every street, lane, and alley. There are two distinct systems for supplying natural gas to private houses in this city, one of which is the Philadelphia company's system and the other is the Chartiers Valley Gas Company's system. The system adopted by the former company consists in a network of pipes laid through the city, generally made of wrought iron, and about four inches in diameter, and connected at certain points with their mill supply system, by regulating valves so set that five pounds is received into and carried on the house supply lines from the mill lines. Now, to reduce this pressure, which is too great to be conducted into a house, a regulating and so-called automatic shut-off valve is used, which reduces the pressure to four ounces or thereabout, which is the proper pressure of gas for burning in private houses.

The advantages of this system to the Philadelphia company are, first, that by carrying a high pressure of five pounds on their house supply lines, they are able to use much smaller pipes than they could if only four or five ounces were carried.

A good automatic regulator and shut-off valve is a good thing if rightly constructed and carefully looked after; but let such a valve be placed in a damp cellar and not looked after, the people in the house perhaps forgetting that it is there at all, now let the main line break after the valve has been in place a couple of years, and in nine cases out of ten the valve will be rusted and will not operate.

The system of house supply adopted and used by the Chartiers Valley Gas Company consists in laying an entirely different network of pipes from its mill supply system, but connected with this system by means of regulating valves, the same as the Philadelphia company's is; but it differs in this important point, that the Chartiers company lays pipes to supply the private houses so large that a pressure of only four ounces need be and is carried on them. The service pipes are then run direct into the consumer's house, no regulating valve or other device being necessary, as the pipes themselves carry no more than is required in the houses.

The question may be asked, Are not the valves that control the pressure between the mill supply line and the house supply line liable to get out of order and let a higher pressure into the houses than would be safe?

We answer, yes; very liable; but of these valves in the entire city there are but four, and there will never be more than eight, and to watch them the Chartiers Valley Gas Company keep watchmen night and day whose sole duty it is to see that these valves are always in order.

In laying its lines for house supply, the Chartiers Valley Gas Company also puts in a thorough broken stone escape system, connecting the stone drain with a lamp post placed every 300 feet along the line.

The statement has been made in the papers that the life of the natural gas companies' pipes underground is but five years, after which they become rusted out and will not hold gas. This statement is not true. There are pipes made of cast iron and laid by the Pittsburg Gas Company, in this city, that have been down thirty-five years, and are still in good condition. A cast iron pipe, as laid by the gas company, will be absolutely safe for thirty years of service, and a wrought iron pipe for twenty years of service. This statement can be verified by nearly every water works superintendent in the country.—*Insurance World.*

The Heathen Chinee.

The Secretary of State is in receipt of a note from the Chinese minister here, returning, by direction of his government, a portion of the Rock Springs indemnity, lately appropriated by Congress, which represents the amount of six claims, which, in the final distribution of the appropriation, have been ascertained to be duplications. Mr. Bayard has appropriately acknowledged this honorable action of the Chinese government, and the amount so refunded will be covered into the Treasury.

Correct book keeping must be at a discount at the Treasury department in Washington, if the above example of duplicate payments is a fair specimen of official abilities.