

XXII.—REPORT OF OPERATIONS DURING 1874 AT THE UNITED STATES SALMON-HATCHING ESTABLISHMENT ON THE M'CLOUD RIVER, CALIFORNIA.

BY LIVINGSTON STONE.

CHARLESTOWN, N. H., *April 5, 1875.*

Hon. SPENCER F. BAIRD :

I beg leave to report as follows: I arrived at San Francisco with the second California aquarium-car on the 12th day of June, 1874, with the intention of resuming operations at the United States salmon-breeding station on the McCloud River, California, as soon as possible. Congress, however, did not pass the required appropriation for the purpose until the latter part of June. As soon as notice of this appropriation reached me, I proceeded to procure supplies, and on the morning of the 4th of July I left San Francisco, and arrived at the United States camp on the McCloud River on the morning of July 5. The rest of our force arrived on Tuesday, July 7. We then numbered nine white men in all: J. G. Woodbury, San Francisco, Cal., foreman; Richard D. Hubbard, Charlestown, N. H., assistant; E. C. Forbes, Clinton, Mass., assistant; Waldo F. Hubbard, Charlestown, N. H., assistant; Oliver A. Anderson, Red Bluff, Cal., assistant; Myron Green, Highgate, Vt., head fisherman; E. Conklin, New York City, photographer; Marshall L. Perrin, Grantville, Mass., secretary; Livingston Stone, United States Fish Commission, in charge.

Our force was occasionally increased by an additional man, but was not diminished till the first shipment of eggs was forwarded east. I brought up from San Francisco a Chinese cook, Ah Sing by name, and employed more or less Indians throughout the whole season, the largest number working on any one day being fourteen. At the close of the last season, 1873, it became necessary to remove the hatching-troughs and water-wheel to higher ground, to put them out of the way of the winter freshets, which sometimes raise the water fifteen feet above the summer level. The dwelling-house, although not above high-water mark, was firmly shored up with timbers. This we found standing and in good order. Our first work was to erect the hatching-tanks and replace the wheel. This being done, we proceeded to build an addition to the dwelling-house to accommodate the increased force of this year, and when this was finished we went to work on the hatching-apparatus and the fence across the river. The hatching-apparatus consisted of the troughs used last year, with some additional ones, in both of which were placed

hatching-trays for the reception of the eggs. The trays employed were made of the usual wire-netting coated with asphaltum. At first, we employed trays ten inches wide by twenty inches in length, and very shallow, placing three tiers one above the other in each compartment of troughs. As the number of eggs increased, the moving of the trays every day for the purpose of inspecting the eggs became a great annoyance, and in place of the shallow trays we substituted deeper ones for the remainder of the eggs. The deeper trays answered their purpose to perfection. The water, entering from the bottom and finding its exit from above the eggs, necessarily permeated all of them continually. It also kept the eggs to a certain degree suspended in the water, so that the underlying tiers were partly relieved of the weight of those above them. At first, we placed the eggs in these trays eight layers deep; but as the season progressed, the deep trays worked so well that the layers were increased to twelve, and, as far as could be learned, without detriment to the eggs.

I am free to say that this combination of deep wire-netting trays with the Williamson plan of hatching-troughs is the best apparatus for maturing salmon-eggs for shipment that I have yet seen. It is simple, compact, and effective. By means of it, we hatched eighteen thousand eggs to the superficial foot of hatching-troughs without the least difficulty; so that in one length of our hatching-troughs, or eighty feet, we matured one million and a half of salmon-eggs.

The fence across the river, to which allusion has been made, was a peculiar feature of this year's operations. Last year, we depended wholly on the seine for securing parent fish. The largest number which could be secured in this way being inadequate to the supply of eggs which was desired this year, I adopted the method of building a salmon-proof fence and bridge across the McCloud River. This had a double effect. It enabled us to capture the salmon in the corrals, or traps, connected with the bridge, and also to stop all the salmon from ascending the river, in consequence of which vast numbers accumulated in the holes just below the bridge.

With the time and men at my command, the construction of the bridge and dam was an undertaking of no small magnitude. The point selected for the purpose was just below the hatching-tents, where the river begins to break over a series of rapids. It was necessary to do the work here, or at some similar place, in order to avoid the deep holes and irregularities of the river-bed, which prevailed everywhere in the channel. This necessity, however, involved the disadvantage of having very swift water to work in—so swift, indeed, that a boat could not be held for a moment along the whole line of the bridge without being made fast to the shore. This disadvantage was the more serious because the snow-water which forms the river is so cold that the men working in it, as they were obliged to, a great deal of the time up to their waists and often up to their necks, could not endure it long without severe suffering. Fortunately, I had with me a force of loyal and resolute men, who

were daunted at nothing, and through their courage and resolution these and all other obstacles were overcome. The space to be bridged over was one hundred and five feet, or, with the corral-extension, one hundred and fifty feet. The line was made across the river at nearly right angles with the current. The water was from four to eight feet deep and running with tremendous force. The river-bed was of loose, detached rocks, varying from a pound to half a ton in weight. We began the work by felling logs in the woods, cutting them into twelve-foot lengths, and hewing off the ends square. Three of these lengths were then laid together horizontally and in the form of a triangle, and the ends firmly pinned together with wooden pins. Another similar triangle was then made and rested on the first, then another, and so on till the structure reached the required height to support the bridge at a suitable distance above the surface of the water. When this was finished, the men waded out with it, with great labor, to its place in the river, with one angle up stream, of course, and fastened it there with cables till it was banked up with rocks, and the hollow space inside was also filled with rocks. When it was done, we had a solid stone pier, resting on the bottom of the river, which the current was unable to move. Another similar pier was then built and placed, and then another and another, at suitable intervals, till the other side was reached. The tops of the piers were then connected with logs, hewed square, and pinned to the piers with strong, wooden pins. This completed the bridge. When it is remembered that we had neither horses nor derricks, but relied entirely on our physical strength to do all the work, it will be seen that it was no trifling undertaking. Nothing was yet accomplished, however, in arresting the passage of the salmon, as the space below the bridge was, of course, except at the piers, entirely open to them. It, therefore, now remained to dam the rapid and powerful current, so that the salmon could not pass. After some deliberation, it was decided to make this dam of poles, about two inches in diameter, placed perpendicularly in the river, with the upper ends resting on the side of the bridge, and the lower ends against the bottom of the river. To facilitate the work of placing the poles, we concluded to make a regular fence of them, laying poles side by side, about one inch and a half apart, and inserting both ends of each pole into a strong cross-piece of hewed timber, running at right angles with the poles. This having been decided on, the next thing was to get the poles. We required a thousand. The nearest that could be found in any quantity were in a forest four miles off, over a rough mountain-trail. I immediately fitted out an expedition, with axes, blankets, and provisions for four days. The thermometer was ranging at that time between 100° and 110° in the shade. In the sun, it was hot enough to cook eggs. This made the work of lumbering rather severe; but at the end of the four days the expedition returned, having procured several hundred poles.

These they packed on their shoulders to the nearest point on the stage-road, where they were brought to camp by the mule-teams returning

from Oregon. I continued sending to this spot for poles until they reported the stock exhausted. We then scoured the woods in the immediate neighborhood of the camp, and gathered in all the scattering ones that could be found till these were gone. There were still many more needed, which were obtained from various quarters, and packed into camp on the shoulders of the men employed.

The poles having been secured, the fence forming the dam was constructed on shore in sections, which, when completed, were taken to the bridge, and dropped into the water at an angle of perhaps thirty degrees with the perpendicular of the bridge. The upper side of each section being now firmly spiked to the timbers of the bridge, the current, striking it at the angle mentioned, forced the bottom of the fence very tightly against the river-bed. All the sections being thus placed, rocks were then piled up around the bottom of the fence and thrust into any crevices which the salmon might get through, and, this work having been extended entirely across the river, the bridge and dam were rendered complete.

The next thing was to build the corrals. These were constructed on the plan of the dam. Two of them, one opening into the other, formed an inclosure of about 50 by 20 feet. They were built on the east side of the river, and communicated, by a mouse-trap gate or opening, with the main stream, so that the salmon could run up into the corral, but could not return. The other corral was constructed on the same plan, about the middle of the river. As an illustration of the work performed on the bridge, I will say that two thousand 2-inch auger-holes were bored under the scorching sun, and no less than two hundred tons of rocks were used in the construction of the dam and corrals, all of which were taken, one by one, and put in their place by hand.

About four o'clock in the afternoon, a few days after the passage of the salmon was obstructed, and before the corrals were made, it was announced that the salmon were making their first assault upon the dam. The whole camp collected on the bridge to witness the attack. It was a sight never to be forgotten. For several rods below the bridge the salmon formed one black, writhing mass of life. Piled together one above another, they charged in solid columns against the bridge and dam, which trembled and shook continually under their blows. Not daunted by their repeated failures, they led attack after attack upon the fence, one column succeeding as another fell back. Encouraged by their numbers, and urged on by their irrepressible instinct, they entirely disregarded the observers on the bridge, and struggled at their very best to pass the unwonted obstruction. Finding the fence impassable, many fell back a little and tried to jump the bridge. This several succeeded in doing, sometimes violently striking the men on the bridge in their leaps, and sometimes actually jumping between their feet.

For an hour and a half this fierce assault continued when, exhausted by their efforts and discouraged by many failures, they fell back to the deep hole just below the rapids, arrested, for the first time

since the McCloud formed its channel, in their progress up the river. The Indians, who were watching their movements, were wild with excitement over this scene, which, even after a residence of centuries on the river, was new to them, and they begged for permission to spear the salmon. This, however, I did not give, as I felt obliged to save all the fish for their spawn.

The bridge and dam were completed, and the river rendered impassable to the salmon, on the 10th of August. From that time to the beginning of the spawning-season, all hands were busy about the preparations for taking and hatching the spawn, which were barely ready when it was announced that the first ripe salmon had been taken. This was the 26th day of August. From this time to the end of September, all hands were kept busy in gathering and taking care of the eggs and extending the preparations for receiving them.

From the end of September till the 18th of October, there was no work done in taking spawn, but the time was occupied in caring for what had been taken, and shipping the eggs to their eastern destinations.

Table of consignments of salmon-eggs, according to order of shipments.

1874.

FIRST SHIPMENT.

Sept. 25. Sent by Wells-Fargo's Express, in charge of Mr. E.

Conklin, to—

A. P. Rockwood, Salt Lake City, Utah.....	150, 000
B. F. Shaw, Anamosa, Iowa.....	150, 000
David Day, Saint Paul, Minn.....	150, 000
George H. Jerome, Niles, Mich.....	300, 000
W. A. Newell, for New Zealand.....	25, 000
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	775, 000

SECOND SHIPMENT.

Oct. 6. Sent by express, in charge of Mr. E. C. Forbes, to—

George H. Jerome, Niles, Mich.....	300, 000
Seth Green, Rochester, N. Y.....	150, 000
B. F. Shaw, Anamosa, Iowa.....	150, 000
David Day, Saint Paul, Minn., forward to Seth Green, Rochester, N. Y.....	125, 000
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	725, 000

THIRD SHIPMENT.

Oct. 9. Sent by express, without an attendant, to—

W. W. Clark, Michigan.....	150, 000
George H. Jerome, Niles, Mich.....	150, 000
A. Palmer, Boscobel, Wis.....	80, 000
Seth Green, Rochester, N. Y.....	150, 000
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	530, 000

FOURTH SHIPMENT.

Oct. 11. Sent by express, in charge of Mr. Clinton Johnson, to—		
R. G. Pike, Middletown, Conn.....	150, 000	
Mrs. J. H. Slack, Bloomsbury, N. J.....	225, 000	
James Duffy, Marietta, Pa.....	150, 000	
Alexander Kent, Baltimore, Md.....	225, 000	
		750, 000

FIFTH SHIPMENT.

Oct. 13. Sent by express, in charge of Mr. M. L. Perrin, to—		
R. G. Pike, Middletown, Conn.....	150, 000	
James Duffy, Marietta, Pa.....	150, 000	
Alexander Kent, Baltimore, Md.....	150, 000	
J. B. Thompson, New Hope, Pa.....	150, 000	
Alfred A. Reed, Providence, R. I.....	100, 000	
Samuel Wilmot, Newcastle, Ontario, Canada...	25, 000	
H. H. Thomas, Randolph, Cattaraugus County, N. Y., afterward forwarded to Seth Green...	25, 000	
		750, 000

SIXTH SHIPMENT.

Oct. 18. Sent by express, without an attendant, to—		
E. M. Stillwell, Bangor, Me.....	150, 000	
E. A. Bracket, Winchester, Mass.....	200, 000	
Seth Green, Rochester, N. Y.....	150, 000	
William H. Cushman, Georgetown, Col.....	25, 000	
Jos. E. Andrews, Rockford, Ill.....	50, 000	
W. B. Robertson, Lynchburgh, Va.....	50, 000	
		625, 000

SUMMARY.

First shipment.....	775, 000
Second shipment.....	725, 000
Third shipment.....	530, 000
Fourth shipment.....	750, 000
Fifth shipment.....	750, 000
Sixth shipment.....	625, 000
Total.....	4, 155, 000

Distribution of the eggs.

A. P. Rockwood, Salt Lake City, Utah.....	150, 000
B. F. Shaw, Anamosa, Iowa.....	300, 000
David Day, Saint Paul, Minn.....	150, 000
George H. Jerome, Niles, Mich.....	750, 000

Seth Green, Rochester, N. Y.....	575, 000
R. G. Pike, Middletown, Conn.....	300, 000
James Duffy, Marietta, Pa.....	300, 000
Alexander Kent, Baltimore, Md.....	375, 000
J. B. Thompson, New Hope, Penn.....	150, 000
Alfred A. Reed, Providence, R. I.....	100, 000
Samuel Wilmot, Newcastle, Ontario, Canada.....	25, 000
H. H. Thomas, Randolph, N. Y.....	25, 000
E. M. Stillwell, Bangor, Me.....	150, 000
E. A. Bracket, Winchester, Mass.....	200, 000
W. H. Cushman, Georgetown, Col.....	25, 000
J. E. Andrews, Rockford, Ill.....	50, 000
W. B. Robertson, Lynchburgh, Va.....	50, 000
W. W. Clark, Niles, Mich.....	150, 000
A. Palmer, Boscobel, Minn.....	80, 000
Mrs. J. H. Slack.....	225, 000
W. A. Newell, for New Zealand.....	25, 000
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Total number of eggs sent out of California.....	4, 155, 000
Hatched and placed in the McCloud River, California.....	850, 000
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Total number of impregnated eggs taken.....	5, 005, 000
Not impregnated, and lost from other causes.....	747, 500
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Total number of eggs taken.....	5, 752, 500

From the 18th of October till the camp was closed up, November 30, the time was taken up with hatching the eggs that were left, amounting to 850,000, and placing them in the McCloud River; in consideration of which, the California commissioners of fisheries contributed a thousand dollars toward the expenses of the campaign.

COST OF THE EGGS.

It is so difficult to separate the expenses of shipping the eggs from the general expenses of the season that the exact cost of the eggs when ready for consignment can only be approximated. The expenses of this season's operations were very much augmented by the addition of permanent improvements, as, for instance, a large tent and several hundred hatching-trays. These improvements ran up the expense of procuring the eggs this season to about \$9,000, including the cost of hatching the eggs for the Sacramento, for which the California commissioners paid \$1,000. There were five million impregnated eggs obtained, which makes the cost per thousand at the McCloud River, \$1.80.

CAMP-BUILDINGS, ETC.

The general plan of the camp this year was the same as that of last, with some improvements and extensions added. The point lowest down

on the river that we occupied was, as before, the lower fishing-ground. Here was the main fishery; the other, from its coming above the dam, being practically abandoned. There were here two or three corrals for salmon, and two or three little wooden structures forming a rude camp for the fishermen. Some distance above this point, and about a hundred yards from the house, were the bridge and upper corrals. The main corrals were on the opposite side of the river, and extended about 50 feet down to the farther end of the bridge. The bridge reached 106 feet across the river to the wheel which raised the water for the hatching-works. A flume connected the wheel with the filtering-tanks at the upper end of the hatching-tents. Next came the distributing-spout, and then the hatching-apparatus proper, which extended 80 feet farther to the end of the hatching-tents. Just at this point was a fishing-ground for trout and "Wyedar deckets;" and a little farther up the stream was a set of hatching-boxes, with wire sides and bottom, floating horizontally in the current. Only a few steps farther up the river came the house in which we lived. Behind was the United States flag on a 50-foot flag-staff, and a little farther on two smaller tents and a brush-camp. About ten rods up the river from this point was an inclosure, or pound, in which the young salmon for the State of California were put before they were old enough to wholly shift for themselves. This terminated our series of works in this direction.

It will be seen by comparison with last year's report, that the arrangement of the camp was similar to that of 1873; the river-corrals and bridge being new, however, as has been mentioned. The hatching-troughs were also extended 40 feet farther in length, involving the use of an additional tent 40 feet by 30 feet. This made the hatching-tents this year 100 feet long. The addition to the dwelling-house nearly doubled its size, making it 28 feet by 26 feet, and giving us three new rooms, one of which was employed for a bed-room, one for a store-room, and one for the photographer's use. The brush-camp north of the dwelling-house was quite a valuable addition of this year. It was very rudely built, after the fashion of the aborigines, but it was located in a shady spot, at the water's edge, and proved to be an extremely convenient place to transfer my office to during the warmer portions of the day, when my room in the house often became intolerably hot. The only other new feature at the station this year were the inclosures, or pounds, for receiving the young salmon intended for the McCloud River. These were built of rocks and covered with brush, and when the salmon were approaching the period of the absorption of the yolk-sac, they were transferred from the hatching-troughs to these corrals, where they had ample space to move about.

THE HATCHING-APPARATUS.

This was on a much larger scale as well as on a different plan from that of last year. The wheel and flume were the same, but owing to

the greater pressure of water against the wheel caused by the erection of the dam, it raised three or four times as much water, or about twenty thousand gallons an hour. If necessary, the wheel could be made to pump up enough water to hatch a hundred million salmon-eggs. The filtering-tanks consisted this year of two tanks brought out in the second California aquarium-car. They were splendid tanks, made of eastern pine, iron-bound, and holding a thousand gallons each. The hatching-troughs this year were all made on the Williamson plan, which obliges the water to run from the bottom to the top of each compartment, as seen in the diagram. There were eight rows of hatching-troughs this year, each eighty feet long. In some of the troughs, the shallow trays were used three deep, with one layer of eggs in each tray. In others, one deep tray was substituted for the three tiers of shallow trays, and the eggs placed eight or ten layers deep instead of one. This new application of the Williamson troughs was suggested by my foreman, Mr. Woodbury, and is, I believe, the best and simplest method yet discovered for maturing salmon-eggs for shipment. By means of it, we could mature forty thousand eggs in each compartment, a quarter of a million in each trough, and one million and a quarter in each line of troughs. As there were eight lines of troughs laid down, our hatching-capacity this year was just ten millions; but it can be increased indefinitely. All the troughs were excluded from the light by covers formed by stretching black cloth over slight wooden frames. All the troughs, trays, covers, as well as the wheel, bridge, dam, and everything else about the place, were made by ourselves on the spot.

THE FISH AND THE FISHING.

The upper fishing-ground, being above the dam, was practically abandoned this year, and almost all the seining was done at the lower ground, where the fishing was good enough to satisfy any one. When the salmon had made an unsuccessful assault upon the dam, they fell back into the hole at the foot of the rapids, which formed the lower fishing-ground. Here they were practically in as secure confinement as if they had been caught and placed in a pound; for the dam prevented them from going up the stream, and their irrepressible instinct to ascend the river prevented them from going down. Every foot of this hole was swept by the seine. No better corral or inclosure for confining the fish could be constructed. Here they had their natural habitat and surroundings, the whole volume of the McCloud River for a water-supply, and nothing whatever to prevent them from keeping healthy and in first-rate condition. It was the best possible kind of a pound for them. Last year, they lashed themselves to pieces, trying to escape from the artificial pens. This year, they kept as fresh and well as could be wished. They accumulated in this hole by thousands. When any were wanted, it was only necessary to extend the net around them and haul them in. Once or twice no less than fifteen thousand pounds of salmon

must have been inclosed in the net. They formed a solid mass reaching several yards from the shore, and filling the net two or three feet deep. If I should say twenty thousand pounds, I do not think it would be exaggerating. For some reason or other, my method of confining and capturing the salmon has been spoken of disparagingly; but if anything more simple, more natural, or more effective can be devised, or anything contrived on a larger scale, I can only say I should like to see it.

The seining for spawning-fish was usually done at night, and what fish were needed for the next day were thrown into small corrals intended for their temporary confinement. The spawning was done under a little brush-camp erected just where the seine is hauled ashore. The salmon were very abundant in the McCloud River this year, apparently more so than last year, although our conjectures on this point could not of course be verified. Young salmon a few inches long were very plentiful, as also were trout of all sizes. There was a large mixture of grilse among the older salmon. These were found very good eating, even up to the time of spawning. Occasionally, we captured a fresh river salmon, having a bright silvery surface, and scales looking exactly as if he had just left the sea. These fish were all very large, and all males. They were very rare, perhaps one in a thousand. One much-disputed point about the McCloud River salmon was settled this year by the presence of the dam. The vexed question has been whether the salmon ascending the McCloud River to spawn ever returned to the sea. Both sides of the question have been warmly advocated; the strongest point urged by the affirmative side being that the yearly run of salmon could not be kept up if all the spawning-fish died at the spawning-grounds, and none went to the sea to return the following year. Whatever may be the merits of the arguments advanced on either side, the fact has been proved this year that the spawning-salmon do not return to the sea. The proof is this: Our dam formed an impassable barrier to the return of the salmon which had ascended the river to spawn. Tens of thousands, not to say hundreds of thousands, which would perhaps be nearer the truth, passed the line of our barricade before it was completed. Not one of these salmon repassed that point on their return to the sea. If their habit had been to return seaward after spawning, they would have crowded up to the upper side of the barricade, as the ascending salmon did to the lower side of it two months previous; but, instead of this, not one was observed to even show the least disposition to pass it, although thousands floated down dead against the dam.

What, then, must be said of their disposition to return to the sea?

The only conclusion that we can come to is that they have no such disposition; that they are not accustomed to do so, and that they all die in the upper waters, which serve for their breeding-grounds; which last statement is confirmed by the fact that at the end of October a live salmon can hardly be found in the whole length of the McCloud River anywhere.

THE TAKING AND RIPENING OF THE EGGS.

The eggs were taken from the salmon, as before mentioned, close to the spot where the seine was hauled in, and where a small brush-camp was erected for the purpose. The spawning was usually done in the forenoon, and was performed very rapidly. The fish, when spawned, were usually given to the Indians, who were always in waiting, like fish-hawks around their prey, to receive them.

The Russian or dry method of taking the eggs was adopted exclusively this season, and the rate of impregnation obtained was very good. The largest number taken in any one day was 457,000. The first eggs were taken on the 31st of August, and the last on the 29th of September. The total number taken was 5,752,500. Below will be found the daily record of eggs taken.

Daily list of salmon-eggs, taken at the United States salmon-breeding establishment on the McCloud River, Redding, Cal., 1874.

Date.	Eggs taken each day.	Total.	Date.	Eggs taken each day.	Total.
1874.			1874.		
Aug. 31.....	82,000	82,000	Sept. 15.....	457,000	3,276,000
Sept. 1.....	25,800	108,000	16.....	390,000	3,666,000
2.....	120,900	228,900	17.....	364,000	4,030,000
3.....	102,500	331,400	18.....	252,000	4,282,000
4.....		331,400	19.....	290,000	4,572,000
5.....	298,400	629,800	20.....	217,000	4,789,000
6.....	234,600	864,400	21.....	126,000	4,915,000
7.....		864,400	22.....	172,000	5,087,000
8.....	453,000	1,317,400	23.....	126,000	5,213,000
9.....	252,600	1,570,000	24.....	126,000	5,339,500
10.....	304,000	1,874,000	25.....		5,339,500
11.....	170,000	2,044,000	26.....	210,000	5,549,500
12.....	234,500	2,278,500	27.....	126,000	5,675,500
13.....	218,500	2,497,000	28.....		5,675,500
14.....	322,000	2,819,000	29.....	77,000	5,752,500

After three or four million eggs had been placed in the troughs, the work of daily inspection became quite a task. I employed chiefly Indians to pick out the dead eggs, and they did it extremely well, their delicate fingers and native dexterity making them quite apt and expert for the work. The shallow trays did very well, although it was a great trouble to lift out the upper ones so constantly, in order to get at the lower ones. This was all obviated when we came to use the deep trays, in praise of which too much cannot be said. With these, it was only necessary, in picking out the white eggs, to raise the tray a little ways out of the water, and then gently immerse it again. The upward pressure of the water would throw the dead eggs to the surface, where they could be picked out without even the touch of a feather. With these trays the hands are never wet, the trays are never changed from their places, the eggs never flow over the top, and the feather becomes unnecessary. In addi-

tion to these advantages, all sediment accumulating about the eggs can be easily run off by gently moving the tray up and down a few times in the water. Besides the tray for hatching the eggs in the troughs, I used floating wire-boxes, placed in the river-current, with very good success. These, unlike the famous shad-hatching boxes, rested horizontally in the water. We had remarkably good luck this season; not a single mishap occurring to any of the vast number of eggs, either in the taking or the ripening of them.

PACKING THE EGGS.

The eggs were packed for shipment this year on the same general plan that was adopted last year. The packing-boxes were made two feet square and one foot deep. At the bottom of the box was placed a thick layer of moss, then came one thickness of mosquito-bar, then a layer of eggs, then mosquito-bar again, then other successive layers of moss, netting, eggs, netting, and so on to the middle of the box. Here a firm wooden partition was fastened in, and the packing renewed above the partition in the same manner as below. The cover was then screwed on the top and another box packed. When two boxes were ready, they were placed on wooden crates made large enough to allow a space of three inches on all sides of the boxes. This space was filled with hay to protect the eggs against changes of temperature. The cover being put on the crate and the marking done, the eggs were ready to ship.

This plan of packing, in spite of many severe criticisms that have been made upon it, seems to work remarkably well. Of those sent to Great Salt Lake in 1873, distant a thousand miles, only 3 per cent. were lost. Seth Green reports a loss on the 200,000 eggs consigned to him in 1873, of only 11 per cent. in both the transportation and hatching. Mr. James Thompson, of New Hope, Pa., writes as follows of the eggs sent him this season: "The 150,000 salmon-eggs shipped from California arrived in splendid order." The entire loss on this lot in transportation and hatching was only 6 per cent.

These facts seem to show that the packing is all right. The trouble with those who found fault with it is that they do not understand what it is that kills the eggs in the lots that do not go well. The mischief is not in the packing, but in the high temperature to which the eggs are exposed in transit. I will agree to take any of these lots of eggs to New York and back to California in this packing without serious loss, if I can have entire control of the temperature of the crates. But what can be expected of eggs that are packed in a hot climate, to begin with; are compelled to travel a whole day in a temperature often much above 100°, and then for several days either where the weather keeps them warm naturally or where the car containing them is artificially heated to an excessive degree, as is the case with the express-cars which convey them; and when, in addition to all this, they are delayed by negligent express-agents several days beyond the regular time? I challenge any one, whatever may be his ingenuity or skill, to pack salmon-eggs so

that they will make the overland journey safely under these circumstances. If the eggs were not destroyed in any other way with those conditions, they would hatch out on the road from the heat, and so perish. I admit that sawdust would be much better than hay for the outside packing, but we should have to haul the sawdust sixty miles in order to get it at all. I propose, however, to use it next year, whatever may be the expense of procuring it.

It should be remembered that the following points must be combined in any method of packing the salmon-eggs that is adopted for the overland trip:

1. They should be compactly arranged, in order to reduce the express-charges, which are enormous at best.

2. The packages should be large and heavy, so that they cannot be knocked about the express-car.

3. The eggs and moss should be massed together in considerable quantities, to retain the moisture in the eggs, and also to be better protected from change of temperature.

4. The method that is adopted should be one that facilitates rapidity of packing, as the first boxes packed suffer while the others are being made ready.

5. General economy in regard to expense should be studied, as, with such a large number of eggs, even a small additional expense per thousand makes a large bill in the aggregate.

6. No method that I have been made aware of combines these advantages better than the one actually employed this season in packing the California eggs.

Many of the incidental causes of loss after the eggs left the McCloud River are shown in the appended report on the various consignments; as also in Mr. Perrin's account, just following, of his journey across the continent with various lots of salmon-eggs.

THE OVERLAND JOURNEY OF THE EGGS.

The very full account of my secretary, Mr. Marshall L. Perrin, of his journey with some of the California salmon-eggs, makes it unnecessary for me to present anything on this subject besides his report; which I give here with pleasure:

"Report of Marshall L. Perrin, employed by Mr. Livingston Stone for the United States Fish Commission, to accompany the fourth lot of salmon-eggs transported from the United States salmon-breeding establishment upon the McCloud River, California, to various States on the eastern coast, during the season of 1874.

"The fourth lot of salmon-eggs left McCloud River camp Tuesday afternoon, October 13, 1874. It consisted of seven crates, not of uniform size, but varying according to the number of eggs within, as follows, together with the names of the consignees, which were marked upon the respective crates:

"R. G. Pike, Middletown, Conn., 150,000 salmon-eggs.

"James Duffy, Marietta, Pa., 150,000 salmon-eggs.

"Alex. Kent, Baltimore, Md., 150,000 salmon-eggs.

"James B. Thompson, New Hope, Bucks County, Pa., 150,000 salmon-eggs.

"Alfred A. Reed, jr., Providence, R. I., 100,000 salmon-eggs.

"Samuel Wilnot, Newcastle, Ontario, Canada, 25,000 salmon-eggs.

"H. H. Thomas, Randolph, Cattaraugus County, N. Y., 25,000 salmon-eggs.

"In all, seven hundred and fifty thousand salmon-eggs. They were packed essentially the same as the former lots had been, in alternate layers, with moss gathered from Mount Shasta, and having mosquito-netting above and below each layer of eggs, so that they could be more easily gathered from out of the moss. Two boxes filled in this way, containing 75,000 eggs each, were placed in a crate slightly larger than the sum of the two boxes, and the space between the crates and the boxes was stuffed with straw. The boxes were bored on all sides with auger-holes, so that water poured from outside the crate upon the straw inside, and also water coming from the melting of ice, which was to be kept on the top of the crates, would enter the boxes and moisten the moss in which the eggs were placed.

"It was especially necessary to keep this lot of eggs cold, inasmuch as it was a later lot and the eggs were more nearly ready to hatch. Therefore I was to try to keep them as nearly torpid, and hence as cold, as possible, in order to prevent their breaking through the shell; in which case, of course, they would begin motion and animal life, and would need a medium of water, and inevitably perish for the want of it. Mr. Stone also wished me to try the experiment of packing hunks of ice, in place of the straw, inside of the crates, as soon as I should arrive with the eggs upon the Central Pacific Railroad to regions where ice was more abundant and obtainable, and keep it up for the rest of the journey.

"The crates were thoroughly soaked for a while before they were loaded upon the large team with which they were conveyed to Redding, 23 miles distant. We left camp at about 4 o'clock p. m., and reached Redding at about 2½ o'clock a. m. The load was very heavy and the road mountainous. During the trip it rained quite heavily, which gave the crates a further soaking with which to begin their long journey. At Redding were ready 250 pounds of ice, which had been ordered, and I put this in pieces upon the crates after they were loaded in the Wells, Fargo & Co.'s express-car. The train started at about half past 3 o'clock a. m., Wednesday morning, October 14. The morning was cold, and the forenoon cool, fortunately, for the car was quite small, and the crates had to be placed one upon another; consequently, ice could be upon only the upper ones, except so far as the under ones jutted out. Therefore I changed their positions twice, and often poured water over

them on the way down to Sacramento, which we reached at 2 o'clock p. m., running into the city and not being left for connections at the junction.

"I found my time here (half an hour) very short in which to accomplish the necessary details, and so had to hurry in order to soak the crates with ice-water; to attend to transferring and icing them with 300 pounds of ice, for which I had telegraphed; to go to Wells, Fargo & Co.'s office to see the agent, Mr. Tracy, about expressing and rebilling the crates, and to obtain from him a letter for admittance to express-cars, which I never used; to buy pail, dipper, and thermometer, besides attending to my personal baggage, tickets, &c.

"The afternoon was hot; and when we left Sacramento the temperatures of the crates were varying from 60° to 63°; but they were loaded upon the coolest part of the car, and I iced them well during the afternoon and soaked them. Soon the temperatures were from 56° to 62°. At evening, the messenger telegraphed for ice at Summit, Cal., which we should reach in the night, and for a slight recompense he consented to be without a fire over night, though it was a cold night and he had started one. Upon arriving at Summit, he found that no ice (strangely) could be obtained there, and obtained a quantity at Boca, a station beyond. On the morning of Thursday, October 15, the temperatures were from 50° to 56°. I turned the crates upside down, which was done every day, so that the eggs should not settle down in one direction, causing in this way too much pressure upon them. We moved them to a rack in the car through which the water would run; and, while the travelers breakfasted at Humboldt, Nev., the engineer backed the train so that we could bring a hydrant-hose into the car and give the crates a thorough drenching. We also got about 400 pounds of ice from a trap-hole in the station-platform. At Humboldt the messengers changed.

"Having a good supply of ice, I commenced the experiment of taking out the straw with which the boxes of eggs and moss were packed into the crates, and substituting pieces of ice, pounded so as to fit its place, in the intervening space between the boxes and the crates. The temperatures at noon were 54° to 60°. At Carlin, Nev., 611 pounds of ice were procured and cut up for the purpose stated above. Finding some of the boxes had no holes in them, at Elko I got an auger and bored some. From Wells onward, the rest of the day, at every station, I obtained a pail of water, and, after cooling it with ice, poured it over the crates in turn. As was also one of my motives in giving them so much water at Humboldt and at Ogden the next morning, I wished to give them all the water possible this day, for the water, especially beyond Ogden through a long region of country, would be very doubtful in quality, and I should hesitate about using it.

"The temperatures that night when I left them were between 38° and 50°; and the next morning, Friday, October 16th, they were from 52° to 54°. Early in the forenoon we changed cars at Ogden, Utah, and while

the other express was being transferred, I gave the crates a heavy soaking by means of a hose. No ice could be obtained at Ogden, but there was enough to last easily till reaching Evanston. On the whole I think it is better to procure ice at unimportant towns or stations *en route*, if possible, than at large cities and railroad junctions; for the quality of the ice is surely just as good, and other details, as necessary as they are numerous, will use the time at the large places. The trouble of transferring ice does not compare with that of procuring a new lot. Furthermore, the new messenger more willingly takes it from the previous messenger than when it is freshly imposed upon him, for certainly it is very disagreeable to them to have their car loaded with melting ice.

"The Wells-Fargo agent at Ogden informed me that Mr. Tracy, at Sacramento, had erroneously billed the crates, and they could not go over the routes which I said it was necessary for them to take beyond Omaha. He was in a hurry and unpleasant; as was also the messenger (from Ogden onward) at first, upon seeing seven big, heavy, dripping crates come into his car. It is not so great an evil that the crates of salmon-eggs come under the care of strangers as the fact that they are handled by constantly-changing strangers. There is a need of some one who will be a permanent friend to them, stand by them, and look out for their welfare in emergencies, and when the express messenger on one route or section changes for the uninitiated one who takes his place. There is, then, a need of some person who shall get this new messenger interested in the cause, and willing to put up with extra and unusual arrangements. The presence of a man in charge of the shipment is not merely better, but I think it is absolutely indispensable, judging from the dealings which I have had with express-messengers and railroad employés; who, when rightly dealt with, are a very obliging class of men. The gentlemanly and obliging manner in which I was treated during the whole trip deserves commendation.

"Toward noon, Friday, October 16, I got some ice at Evanston, Utah, and proceeded for the rest of the day to unpack straw from more crates, and put in the abundant ice and refilled the crates where the ice which I had previously put in had melted. The temperatures at noon were 53° to 56°; and at night were 42° to 56°. As I should have stated before, the way in which I took the temperatures, three times a day, was by thrusting a thermometer between the slats of the crates into the straw which surrounded the boxes. This, of course, does not precisely indicate the temperature of the eggs inside the boxes; they may be warmer or they may be cooler. If not attended to, and left to grow warm, the eggs must either increase in heat from the center outwards, or heat from the outside, the center remaining coolest. Now, when care is taken of the eggs, the stratum of cold, damp straw, in not allowing hot air from outside to touch the boxes, prevents the eggs from heating from the outside. Hence, when properly attended to, they will heat only from the center outward. This happens by the spoiling of the eggs in the mid-

dle; the fungus, attaching itself to the next egg, spreads outward after the manner of a warm, damp mold. This suggests two improvements: First, that the eggs might be packed in smaller boxes, so that the center eggs might not be so far away from the ice; and secondly, that some method might be devised for removing the decaying eggs during the journey. However, if the crates are attended to in a thorough manner, the present plan of packing does not much demand the proposed improvements; and as to removing the decayed eggs, the loss is not of a greater per cent. under the present system than would inevitably be caused by the disturbance produced by any method of removing the diseased eggs.

"Friday night was a very cold night, and the messenger seemed to be of that opinion the next morning, having walked back and forth, unable to sleep during the night, in the icy car, which they are not allowed to leave. Saturday morning, October 17, the crates were in temperature from 44° to 47°. They were turned over, and we moved them to the coolest part of the car, out of the sunlight. At Laramie, Wyoming, I procured a large quantity of ice, and watered the crates with ice-water, and repacked them with ice, as well as laid large pieces on the top of them.

"After having once removed the straw, it kept me almost constantly busy to keep the crates packed with ice. The intervening spaces between the boxes and the crates were very narrow, not large enough to admit pieces of ice larger than an apple, and the slats were too near together to crowd ice between them. To pack any side of a crate, therefore, it was necessary to tear off the slats of the crate each time, and nail them up again; which of course weakened the crates, and their structure would not allow any of the slats to be left off. This method of packing with ice consumes a large quantity of that article, and in the present case it was slow work to break it up into pieces of requisite size. Furthermore, the pieces were necessarily so small that they rapidly melted, and the finishing one round of filling the crates with ice was but the signal to begin again with the first on another round. Inasmuch as this method of packing with ice was a primitive experiment, and also not decided upon in time to construct the crates otherwise, many of these inconveniences were present in this case which need not be considered as necessarily accompanying the packing with ice. From the effects of my trial, I consider that the packing the crates with ice is a very plausible and practical method, and a decided improvement, if the crates are properly constructed, and if some one is constantly ready to renew the ice when it becomes melted to even a slight degree, so that a warm draught of air may not be allowed to strike the boxes at any point. The water from the melting ice permeates the boxes containing the moss and eggs, through the auger-holes, which is an additional item of advantage.

"The temperatures Saturday noon were 41° to 47°. When the express messengers changed at Cheyenne, Wyo., we conjectured that the

wrong billing of the crates could be rectified at Omaha, but matters were worse from that point onward. The condition of things was as follows: There were seven crates; two of them (for Newcastle, Canada, and for Randolph, N. Y.) I was to send from Chicago by northern routes direct to their destination; the others, for Marietta, Penn., New Hope, Penn., Baltimore, Md., Middletown, Conn., and Providence, R. I., I was to take with me over more southern routes from Chicago, and send the Baltimore and Marietta crates to Harrisburg, Penn., the New Hope crate from Philadelphia, and go on with the Middletown and Providence crates to New York, from whence I should send them to their respective cities. This was the only plan which could be carried out with success. Mr. Tracy, the Wells, Fargo & Co's. agent at Sacramento, billed some of the crates locally, *i. e.*, to be rebilled at every change of railroad or express company, and some he billed through to New York City. The billing, though he emphatically assured me it was right, was apparently indiscriminate. One of those which I wished to send from Chicago was locally, and one through billed; three of those which were to go over the southern routes were through, and two of them locally billed. Those through-billed must all go to New York City by northern routes, and then come around to Baltimore and their other destinations. This is because the southern routes from Chicago are run by the Adams Express Company, and the northern by the United States and American Express Companies; as the Adams runs only from Chicago, the other two receive the express at Omaha, and carry it by their own northern routes. I must, in some way, have all together with me, that I might attend to them. They could not all go by the northern routes, because the Baltimore, New Hope, and Marietta eggs would surely perish before getting to New York City over northern routes and around again to Maryland and Pennsylvania. There was only one way to do: they must all go the southern route from Chicago, billed or unbilled! The route from Omaha to Chicago was also quite doubtful. The United States and the American Express Companies both run into Omaha, and receive, from the Union Pacific, express alternately, one receiving the locally and the other the through-billed express."

"The temperatures of the crates Saturday evening were 42° to 50°. The night was going to be very cold and I had much ice in the car. The messenger was willing kindly to go without a fire for me, using my blankets in addition to his own. An accident late at night delayed us five and a half hours near Sidney, Neb., at which I had some thought of telegraphing to Mr. Tracy, at Sacramento. Sunday morning, October 18th, the temperatures of the crates were between 40° and 48°.

"The crates were now kept full of broken ice. As this broken ice rapidly melted, and the crates needed to be replenished often, I decided that should the crates be obliged to leave me in divisions, it would be much better for them to be packed with hay. The hay would keep them much cooler and more moist, and hold the moisture from the melting

ice on the top ; whereas, if no hay was around the boxes they would be directly exposed to the warm, dry air, unless the crates were kept constantly full of ice. Therefore, I procured 75 pounds of hay at Grand Island, Neb., together with 400 pounds of ice, and during the day packed up the crates with hay, which, of course, was dry, and watered them with ice-water at every station until they were very wet and cold. The temperatures Sunday noon were between 48° and 57°. An accident delayed us until we were almost seven hours late.

“Reaching Omaha the circumstances were anything but propitious for arranging matters. It was quite dark ; it was Sunday night, consequently not many authorities could be found ; the only agent who was at the station, having any power at all, was intoxicated. There is always hurry and confusion about the transfer across the Missouri, and especially as the train was so many hours late. It would be better to have the crates go to Chicago by the United States Express Company, as they were then more likely to go on well from Chicago. It being Sunday night, however, only the working employés were around, and their orders were such that I could get only the locally-billed to go by the United States Express, the others going by the American Express over another route. Therefore, at Chicago I must persuade the authorities of both express companies to give up their crates to the Adams Express, which runs over the southern routes from Chicago, by which the crates must be carried. While making the transfer across the Missouri River I found it could be possible to have all go to Chicago by the American Express. Hence, in Chicago I would have only one party to deal with ; so all the crates unitedly, and myself, went to Chicago by that route. This outline of express troubles, filled in with a numerous amount of stubborn details and minutiae, which were hard to overcome, caused me incessant anxiety concerning the preservation and final safety of the eggs ; and, indeed, the express difficulties with this lot only began at Omaha, to continue onward to the end of the trip ; but in this report it will be needless to particularize them.

“At Dunlap, Iowa, though very late, I procured 400 pounds of ice which I fixed over the crates ; before which, however, I removed the slats from several crates and opened the boxes containing the eggs to examine them. They seemed to be in excellent order, at which I was very much encouraged. The temperature of the crates was warmer than usual, being 53° to 56° ; but I was not afraid that it would rise, for the night was to be quite cool. The next morning, Monday, October 19, the temperatures were 50° to 50½. I obtained some ice at Clinton, Iowa, in the forenoon. The day was warm, and a good deal was used. At noon the temperatures were from 51° to 52°. Very fortunately, indeed, just before entering the city of Chicago, the superintendent of the American Express Company, (the company with which the crates then were,) came into the express-car. He was the person whom I could influence to the best advantage, and his was just the authority I was in need of.

It was through his intervention only that the agent at Chicago would be or was willing to do what I desired; and the eggs were not to be delayed longer than necessary. We rode with all the crates to the Michigan Central depot, where the two crates for Newcastle, Canada, and Randolph, N. Y., were left, and with plenty of ice. I saw the agent and left a note for the superintendent, and instructions were also given to all the messengers *en route*. The five remaining crates were carried to the office of the Adams Express, into whose hands they were really delivered and rightly bound. It was dark and cool, so they did not suffer by being on the sidewalk while waiting for the outward express. Leaving them in charge of a policeman, I telegraphed to the following four consignees of the salmon-eggs:—H. H. Thomas, Randolph, Cattaraugus County, N. Y.; Samuel Wilmot, Newcastle, Ontario, Canada; Alex. Kent, Baltimore, Md.; James Duffy, Marietta, Pa.;—stating that their crates of salmon-eggs were leaving Chicago that night by certain trains, which I specified.

“Soon the crates were loaded into the express-car at the depot of the Pittsburgh, Fort Wayne and Chicago Railroad; 400 pounds of ice were obtained, so that they kept finely through the night. The messenger made a great ado, and, though the night was not cold, he thought it dreadful to go without a fire. The eastern men on medium nights were much more appalled at going without a fire than were those upon the western roads, across the plains and mountains, during those intensely cold nights. Nevertheless, all hands went without a fire for me, and the crates were not in the presence of one during the journey across the continent. The temperatures of the crates at time of starting from Chicago were 46° to 50°. Being very tired I did not rise early the next morning, and the messenger neglected to get any ice at Crestline, Ohio, but it made not much difference, as there was enough to last to Alliance, Ohio, where I procured 250 pounds. The temperatures of the crates Tuesday morning, October 20, were 41° to 43°, and at noon were 42° to 47°. When not packed with ice it is much harder to keep them down to such an excellent degree of coldness, but I managed to attain this end by means of often wetting them with ice-water. In the afternoon I looked into the eggs again and they appeared very satisfactorily and well, showing a much less mortality than I had feared would take place through so many changes. Only a small per cent. appeared to have perished or to be unhealthy. The temperatures at night were 49° to 50°.

“Every change of cars had brought new troubles; and especially were large cities to be dreaded, because there would be so much more hurry and business going on. Therefore I was anxious riding into Pittsburgh. The train which connected at Pittsburgh for New York with our train never takes any express, and made very close connection, and it was impossible to arrange for the crates with that train. As it was, the express-men at Pittsburgh said they could not make special arrangements, the rules and customs were inflexible, and that crates bound for New

York (Middletown and Providence) must go the next morning, and the Marietta, New Hope, and Baltimore crates the next noon. It was then about 8½ o'clock in the evening. This proposed delay was out of the question, and must not be permitted, if I could possibly avoid it. As at Omaha, it was night, and only employés about. Finally I found one who appeared to have more authority than the others. He agreed that if the night-man should say it was practicable, he would authorize him to put a car of the New York Pacific Express upon the night-train at 2.50 a. m., though in doing so it would be stepping a good way beyond his official power.

"In this car the crates were put, and I procured two or three hundred pounds of ice and arranged the crates. There was no messenger to go with the car, and the strict rules of the express company require that in such case a car must be locked and sealed, therefore I was unable to take the temperatures the next day regularly. All the crates went together, as the agent at Pittsburgh telegraphed to Harrisburg to have the seal broken and the three crates for Baltimore, Marietta, and New Hope taken out, and also to have 400 pounds of ice ready. He also telegraphed to the agent at New York to forward the other two crates quickly upon their reception. After this I telegraphed to the following five consignees of salmon-eggs: James Duffy, Marietta, Penn.; Alex. Kent, Baltimore, Md.; James B. Thompson, New Hope, Bucks County, Penn.; Alfred A. Reed, jr., Providence, R. I.; and R. G. Pike, Middletown, Conn.; stating by what route and train their crates left Pittsburgh that night.

"At Harrisburg, which we reached at noon, the telegram had been received, and a team took the three crates to the office, where they would remain cooler than at the station waiting for their respective trains. The night and forenoon had been cool, and the crates had been by themselves in the closed car in an undisturbed atmosphere, with so much ice that they were very cold, being about 37°, and the ice had melted but little. Hence the ice ordered by the telegram was not needed, and I put most of it on the crates which were to leave me. Also, I gave explicit instructions about the care of these crates, and fastened upon them notes to the messengers in charge till at their destinations. These were the Marietta, New Hope, and Baltimore crates. The other two for Middletown and Providence were again shut up in the car and it was sealed until it should reach New York.

"We arrived in New York at about 7 o'clock p. m. The car had not come with us farther than Philadelphia; the train out of that city does not take express. This I did not know, but it was just as well, because in the cold closed car, alone, and with ice through the night, they would be in a better situation than if they had come to New York and waited till morning in the warmer office of the Adams Express. They came up from Philadelphia early the next morning.

"The admirable manner in which the crates of eggs kept, and the fine

condition in which they remained during their 30 hours in the closed car is very noteworthy and suggestive. The ice melted but little; the moisture and water evaporated but slightly from the straw; there were no currents of warm or of dry air to strike the boxes; and the crates preserved a remarkably low degree of temperature, colder than I had known them to be at any other time, being 37° when I noted it at Harrisburg. I think they could have remained in such circumstances for a much longer time than they did, without needing much care, and have continued in excellent order. The methods and irregular times and intervals at which the salmon-eggs are taken from the parent-fish and matured, make the lots to be in different stages of advancement at a given time. If, however, some way could be devised so that several lots or a larger number of crates could make the trip at one time, it seems to me that it would be very proper to provide a car to run across the United States, containing only crates of salmon-eggs. It would not only make it decidedly more convenient to take care of the crates, but it would improve greatly the means for the preservation and safety of the eggs. Beside the advantages mentioned above, of the ice not melting, the moisture not evaporating, and the excellent degree of coldness preserved in an undisturbed atmosphere, others suggest themselves. Judging from the fact that the eggs at all other times are placed in running water, it seems probable that it would be well not only to keep them wet and in wet moss, during transportation, but also allow them more changes of water, by drenching and soaking, than can be done easily in express-cars. Many modes of watering and soaking could readily be devised; there would be place and room to harbor a large quantity of ice for use, to carry the requisite tools, and to have plenty of room to work in; the strong draughts of warm, dry air which rush in upon the crates from all the four doors of an express-car when opened at every station would be avoided; some refrigerating-apparatus might be prepared which would preserve a regularly low temperature; the eggs might be carried in such a way so that they could be picked over on the journey; for if better otherwise, they need not be packed in a portable manner, since not to be transferred so often; the eggs would be entirely freed from the jarring and banging which is injurious to them, and which they receive when changing cars; and the express difficulties and troubles arising from the billing, transferring, separating, and losing the crates would be entirely done away with. This special car, though not quite so necessary in this case, would be of the same nature, and have similar advantages, as those which, in the transportation of live fish and lobsters, the aquarium-car possesses over the inadequate facilities of the express-car.

“The sealed car, as I have said, reached New York Thursday morning, October 22, and the crates were carried to the Adams Express office, where more ice was immediately put upon them. I saw the Middletown crate off by the forenoon train from New York, and the Providence one

by the boat; also I saw the messengers who were to accompany them, and instructed them, and ordered them to so instruct the messengers who should take their place, if there was a change before the crates reached their destinations.

"I learned afterward that the Providence crate was several days before reaching its destination, from New York, through some carelessness or oversight on the part of those having charge of the express between the two cities. Hence this crate of salmon-eggs suffered so much loss, some 30 per cent., I believe, that it was not as successful as the rest of the lot. This incites me to repeat that it seems, not only better, but very necessary to have some one accompanying the crates from the beginning to the end. There are many minute details also which will be overlooked, carelessly or otherwise, by the messengers; and it is so indispensable, in order to insure the healthiness of the eggs, that all these details should be performed, that if anything is to be done, the person accompanying the salmon-eggs must attend to it himself, or superintend it personally.

"Respectfully submitted.

"MARSHALL L. PERRIN."

LIFE IN CAMP.

Owing to the remoteness of the situation and the peculiar nature of our surroundings, a few words about our life in camp may possibly not be out of place.

The time passed very pleasantly with us all through the season. The work of the campaign was of course the main feature of the life here, and in this all seemed equally interested and bent on success. There was one peculiarity about the work: it was always driving us, even to working Sundays and nights, while we, on the other hand, were always looking forward to a time of comparative rest. This time of rest never came. At first we had to rush the work with all our might to get the house built and the two hatching-tents put up in season. Then came the cutting of the poles and felling of the logs for the bridge, and then the building of the bridge itself. No time was to be lost in this work, for the spawning-season was coming on rapidly, and, if the dam was not completed in good season, before the salmon stopped running, it would do no good. The bridge was no sooner finished than all hands had to go to work with a will on the hatching-trays and hatching-apparatus, in order to get them done in time for the eggs. This seemed almost an endless job, so many hundred wire trays had to be made and so much surface covered with asphaltum.

The hatching-apparatus was hardly ready when the eggs began to come on. Then the camp was busier than ever, and, when this work of ripening the eggs was at its height, the earlier lots had become ready for shipment.

Probably no one inexperienced in packing the eggs of fishes realizes

how much work there is in packing a half a million eggs; but if he will undertake to pack 5,000, and then reflect that this must be repeated one hundred times to make a half a million, he will get some idea of it. In the first place, preparatory to the packing, the moss is to be obtained. Mr. Woodbury had charge of the expedition for the moss. They went sixty-five miles for it, and returned in twelve days with a hundred bushels. This moss had to be all carefully washed, picked over, and separated. Then the sixty packing-boxes were to be made, and thirty crates to send the eggs off in.

This preparatory work being done, and the time being come for making a shipment, all hands took hold of the work of placing the eggs in the boxes. We usually allowed two days to pack, box up, and mark a lot of 750,000, but on one occasion we packed the whole 750,000 in one day. Now that the fishing, spawning, ripening, and packing of the eggs was all going on at once, it can be easily seen that we had no time to rest. The first lull in our work came when the fishing was stopped and the seine hauled up for the season. This relieved the night-gang; and the reduction which had been caused, by various shipments, in the number of the eggs to be looked after, gave us a slight breathing-space, which I employed in making slight improvements about the ranch, such as putting an open fire-place in the house, for the nights had now become very cold, and in bringing up incidental work that had fallen behind in the hurry of the previous month. From this time, although the work did not drive us as it did in the summer, we had plenty to do. There were still two or three million eggs in the troughs, nearly a million of which were to be hatched for the McCloud River. The hatching-troughs, bridge, wheel, flume, dam, and tents were to be taken down and packed away, out of reach of the winter floods, and all the thousand little things to be attended to that are connected with the closing up of a place like this. Still, this work seemed light, compared to what we had been through. It was not a little ludicrous to reflect, afterwards, that when we considered our work all done, we had still *nearly a million of eggs to hatch*, a task that, under other circumstances, would seem quite formidable; but so strong was the contrast between it and the larger work which had been accomplished, that it seemed almost like nothing at all.

I have dwelt longer than perhaps appears to be necessary on the character of the work done at this station this season, because I am aware that to some it may appear quite incomprehensible what we had to do with so many men for so long a time. I can assure them, however, that there was enough to do every moment, and such things as idleness or loafing were not known in the camp. I think I ought to mention particularly here the services rendered by Richard and Waldo Hubbard, grandsons of Governor Hubbard, formerly United States Senator from New Hampshire. These two young men were always found equal to any occasion, whether it was to fell trees all day under the scorching California sun, or to work for hours immersed in the icy water of the

McCloud; they never once flinched at the severity of their work or hesitated to do anything that was required of them. Tall, stalwart, and muscular, they added a good deal to our reputation with the aborigines of the McCloud by throwing their champion wrestlers, while their strength, at the same time, when turned, as, indeed, it always was with undauntable resolution and energy, to the work of the camp, rendered their services invaluable.

By singling out these two, I do not mean to disparage the others, for all worked well, and the Hubbard boys typified rather than contrasted with the work that was done by all. As an illustration, I will quote the following paragraph from the Sacramento Record of August 29, 1874:

"They (the party at the McCloud camp) have demonstrated that, for rapidity of action, endurance, hard labor, and practical accomplishments, their physical training is of a high order. Sleeping upon the rough plauks of the living-room; draped in coarse woollen shirts and heavy pantaloons; with bare feet, or in jack-boots or moccasins; arms and breasts bared; tanned brow; muscles wrought up like iron, and all grim with the marks of labor, Mr. Stone has a party about him of both brain and muscle, proving that hard and serious labor can be evoked from students' arms, and that cultured intelligence and horny hands may meet in harmony. Look about the camp; every artificial thing is their handiwork; they are at once plumbers, fitters, carpenters, tailors, fishermen, geologists, chemists, artists, blacksmiths, lumbermen, loggers, and so on."

At the busiest part of the season the work was distributed somewhat as follows:

September 28.—Total number of hands employed, 24.

Picking over moss	4
In the hatching-house	7
In kitchen and about buildings	3
Hauling seine	5
Spawning salmon	3
In office and superintending	2
	<hr/>
	24

The nature of our labors did not cut us off wholly from recreations, for which all found some time on summer evenings and on Sundays. There being no church within fifty miles, the time on Sundays was usually taken up with excursions to neighboring points of interest. Sometimes we went to Copper City, a settlement of two houses and five men, about fourteen miles from the McCloud River. Sometimes we went to the iron mountain, two miles distant, where a vast deposit of iron ore has been recently discovered. Sometimes we went up the river to hunt for game, or climbed the steep-pinnacled rocks of Mount Persephone, just opposite the camp. The summit of these extremely interesting lime-

stone rocks we ascertained by the aneroid barometer to be 3,400 feet above the level of the sea, or 2,600 above the McCloud River.

In these limestone mountains we found two caves. One was an almost circular cavity in the side of the mountain, about 30 feet in diameter and 109 feet in length, with a floor nearly level, forming a magnificent chamber, with fresh green maiden's hair growing in large clusters downward from the roof. This cave is at an altitude of about 2,000 feet and is very difficult of access.

The other cave is similar and more easily reached, but has in addition a dark narrow passage-way leading through the interior of the mountain to a deep perpendicular abyss with re-entrant sides, from the bottom of which nothing, having once fallen in, could ever escape without wings or help from the outside. It is a place of such peculiar terror that I will describe our exploration of it. Having resolved to visit the cave, and having secured a guide in the person of Dr. Silverthorne, an old resident of this locality, we finished work at 5 o'clock on Saturday afternoon, and taking our blankets and necessary provisions, together with candles, lanterns, axes, ropes, &c., we proceeded to the foot of the mountain that evening, and, having cooked our supper, camped there over night. In the morning, after an early breakfast, we started for the cave.

Entering the main opening, we proceeded about 50 feet to a smaller opening in the right-hand wall of the cave and about ten feet from the floor. Climbing up into this we kept on through a narrow passage-way to a point about 30 feet from the entrance, where the passage dwindled into a small hole just large enough to admit a man's body. Here we all hesitated for an instant. Horrible visions of rattlesnakes and tarantulas and bottomless pits rose up before us and kept us back, but only for an instant. I happened to be the first through on the other side, and found this low archway led to another passage similar to the one we had left. On we went, turning several corners, but along a floor which kept nearly level until we came to a second archway, supported by round crystalline limestone pillars on either side. Here the level line of the floor became depressed to an angle of perhaps 30 degrees. The very blackness of darkness prevailed, which the candle we had with us seemed to only make visible. So intense was the darkness that the candle rays did not enable us to see six feet before us. Every one stopped involuntarily. No one wanted to begin the descent before us, and it is fortunate no one did, as the sequel will show. Presently some one proposed to throw a stone down the incline and listen to its descent. We did so. There was a breathless silence. The stone rolled along the incline, then bounded off and struck again far below, then again, and again, the sound reverberating as if it came from the depths of the earth. We were appalled. Two steps farther in the dark passage-way before us would have been instant death. Ropes were now brought and more lights, and before long we had a rope-ladder constructed, about 20 feet

in length. It was lowered down the abyss, but did not reach the bottom. A strong line was fastened to it and it was again lowered. After paying out 30 feet of the rope the lower end of the ladder rested on something solid. A lantern attached to a 60-foot rope was then lowered down, and though its very feeble light was wholly inadequate to the requirements of the situation, we could see that there was a landing-place of some sort at the foot of the ladder, though whether it was at the edge of another abyss or not, or whether there was any substantial foothold there, could not be discovered. The place might be full of rattlesnakes or tarantulas, or it might be a bear-cave with other openings on its own level, for all we knew. I confess I had no disposition to swing off and slide down the dangling rope into the impenetrable darkness, without any assurance of foothold at the end of it. But not so with the brave fellows who were with me. They even contended among themselves as to who should be first to make the descent, and as soon as the word was given they sprang eagerly to the rope and swung themselves off without a faltering motion. Imagine a rope dangling loosely from a church-tower fifty feet in height, in the middle of a dark night, and a man without any special experience in that sort of thing swinging himself out on it for a descent, without knowing what was at the lower end of it. The case in question was worse if anything, for here there were all the grim surroundings and mysterious associations of a dark, forbidding, and unexplored cavern.

Dick (Richard Hubbard) begged earnestly to be the first to descend, but the lot had fallen to Green, (Myron Green,) and in a moment more he was seen on the rope dangling in mid-air, and in the next he became lost entirely to the sight of those above.

It seemed an age before he called out that he had reached the ladder. This hung so loosely that it was hardly better than the single rope, except that it gave a chance to rest. Another long silence, at the end of which he shouted that he had reached the bottom, when Dick sprang to the rope and swung off. Just at this moment the lantern which had been lowered to Green fell over and went out, and he was left in the impenetrable darkness. With perfect presence of mind, however, he felt for it, found it, and lighted it again, and reported a foothold at the bottom sufficiently large at least for a landing-place. Waldo Hubbard immediately followed Dick, and soon all three were at the bottom ready to proceed with further explorations. The opportunity was now afforded to the rest to make the descent, but no one came forward, and it soon became evident that Dick, Waldo, and Green would be the only ones that day to explore the abyss. This having been announced to those below, the exploration began, the result of which was as follows:

A chamber was found, 150 feet long and 40 feet wide, with a floor sloping slightly downward from the point of entrance. The chamber was, of course, the depth of the descent, or from 50 to 60 feet. Stalactites and stalagmites of beautiful crystalline structures, as is common in

limestone formations, were found, and all the usual curiosities of a limestone cave; but what surprised all of us most was the discovery of several bones, partly coated with a limestone petrification. Whether they were human bones or otherwise we could not tell, but no one could help reflecting on the awful death that the creature, whether man or beast, to whom the bones belonged, must have endured, under the combined horrors of solitude, darkness, thirst, and starvation; nor could we help indulging in curious, though profitless, speculations as to the circumstances which led this hapless creature on to its terrible end. After spending about an hour and a half in exploring the cave, without finding an outlet, the explorers cut the letters U. S. F. C. in the rock, and filled a sack with the curiosities they had collected, which was fastened to the end of a rope, and pulled up by those outside. Then commenced the difficult and dangerous ascent. All three reached the top safely, though nearly exhausted; and, after retracing our steps to where we could once more see the welcome light of day, the party cheered the explorers, fired a salute, and returned to the camp.

The recreations in summer evenings usually consisted in boxing, wrestling, running, jumping, bathing, and target-shooting with rifles, revolvers, or Indian bows and arrows, and other similar outdoor amusements. Occasionally a gold-fever would strike the camp, and parties would hunt for gold around the house, but never with any paying returns, though considerable gold-dust was collected altogether.

Our table this year was well supplied. Possibly relying upon the general protection afforded by the presence of so many white men at our camp, one of the neighboring ranchmen did what had never been attempted before on the McCloud, namely, to drive a flock of sheep into the Indian country on the east side of the river. Hitherto this land had always been given up to the Indians for pasture for their horses, and when the sheep came, destroying every blade of grass, and leaving a desolate waste for their horses, the Indians resented it, as well they might. It certainly seemed cruel in the extreme, but, agreeably to the maxim that there is no great loss without some small gain, our camp was kept in capital mutton (it has not its superior in the world) from the sheep which brought such calamity upon the original owners of the soil. Besides the mutton, which was regarded as the principal luxury of our table, we had for fresh meats, venison, and occasionally, but not often, beef; and for cured meat, ham and bacon. Salmon and trout, of course, we had in abundance, and they were, each in its season, excellent. Of fresh vegetables, we had potatoes, onions, and tomatoes in abundance, with some turnips, green corn, and string beans. Baked beans were on the table at every meal.

The camp was kept well supplied with fruit, especially grapes, apples, and peaches, through the kindness of one of our neighbors, Mr. Clinton Johnson, who would take no return for his generous supplies, except

an occasional present of salmon. The grapes in magnificent bunches were especially delicious.

Ah-Siu, our Chinaman, was a good cook, he made excellent bread, and always succeeded in giving us a very palatable meal.

The weather was of course pleasant till the end of the dry-season. Once we had a shower in the air, as it might be called, for it really did not wet the ground, and on a few days there were clouds in the sky; but with these exceptions the days were perfectly cloudless.

This summer was an unusually cool one, and there were but very few occasions when the weather was uncomfortably hot, although on one day the thermometer rose to 157° in the sand near the house; and we actually cooked an egg in the heated sand.

The nights were very cold, as is usual in this mountain region, the difference between the temperature at 3 p. m. and 7 a. m. of the same day usually being as much as 40°, and sometimes 50°; *e. g.*, July 9, July 20, September 3, as will be seen by the table of temperatures. (See p. .)

The heat of the sun in the middle of the day was, of course, severe, and extremely so on the exceptionally hot days. The wonder is that the young men from New England were able to endure it as they did.

The rainy season came on about the middle of October, two or three weeks earlier than was expected. From that time till our camp broke up, in the latter part of November, it rained, with an occasionally pleasant day now and then almost all the time. One morning early it snowed, though no snow remained on the ground; one of the rains was terrific.

It did not seem possible that the clouds could pour down such a deluge of water in so short a time. The rain fell in sheets and columns. The dry gulches about the camp became, in ten minutes, river channels, which would float a boat. The McCloud rose six inches in half an hour, and became apparently as turbid as the Sacramento. The gutters to the roof overflowed; the water poured down the chimney, and extinguished the fires; the swollen current of the river snapped the bridge in two in the middle, and carried one of the 20-ton stone piers a rod down the stream. It was literally a deluge while it lasted; then suddenly it stopped raining, the clouds vanished, the sun came out, and as lovely a day followed as ever was seen.

Two wind storms visited the McCloud Valley while we were there. The first lifted the large tent like a feather, and brought it to the ground with a collapse as sudden as it was unexpected to those working inside. The second was equally severe, and would have done the same mischief, had we not taken the precaution to wire the tent down with coarse iron wires.

Our quarters were tolerably comfortable. They consisted of a one-story building 24 feet by 26 feet, containing six rooms. They were the bunk-room, 12 feet square, containing 8 bunks, a fire-place, and nothing else; a store-room, 6 feet by 8 feet, where the supplies were kept, with the bunk for the Chinese cook; a front room, 12 feet by 14 feet, with

four bunks; a kitchen, 12 feet by 6 feet; Mr. Woodbury's room, 6 feet by 12 feet, with two bunks; and my own room, of the same size, with one bunk.

These quarters would be considered rather small in New England for our large force, but in this climate people really live out of doors, and most of our Indians slept outside, either in the small tents or under the open sky.

Through the dry season we dined, and, indeed, had all our meals on the large piazza in front of the house, which was protected from the sun's rays by means of an awning. During the fishing season, the fishermen slept at the camp at the lower fishing ground.

Of the natural surroundings of our camp, an idea can be obtained from the following paragraph taken from an article by Mr. William M. Turner in the *Overland Monthly* of January, 1875:

"This stream has been selected with good judgment. Fed by the eternal streams of Shasta, some seventy miles from its mouth, its waters are icy cold, and, as yet, undisturbed by the miner's pick, as clear as the sunlight that pierces its azure pools and whirling eddies. No dams or other artificial obstacles obstruct its course, and it is now the most prolific and favorite spawning ground of the Pacific. A point on the river about twenty miles from Reading, the present terminus of the Oregon and California Railroad, and about three miles from its junction with the Pit River, one of the largest tributaries of the Sacramento, has been selected for the hatching works, and, among all the beautiful spots in California, none more lovely nor more grandly picturesque than this could have been chosen.

"The grade of the California stage-road curves over the hill a few hundred feet above the fishery, and from this point the view is magnificent. Eastward Mount Persephone, an immense wall of granite, shoots up athwart the sky, rising abruptly over 2,000 feet from the water's edge, seamed and scarred by the by-gone ages, and frowning down sullenly, as if jealous of the innovations below. Round the base of 'Big Mountain,' the beautiful river sweeps like a blue ribbon, flecked and sparkling here and there with bits of silver spray that bubble up from its ever-changing, restless current. Willows and water plants fringe the banks with their graceful drapery; wild flowers of brilliant hue light up the rugged hillsides; the bright, airy green of the manzanita shimmers on ridge and mountain crest; and the great moss-covered oaks, swinging their gnarled branches amid the music of the waters, lend a charm to the scene of peaceful beauty."

OUR NEIGHBORS.

Our neighbors were Mr. George Allen and wife, who kept the stage station a mile and a half west of the camp; the ferryman at Pitt River Crossing, four miles down the river, Mr. O'Conner, commonly called "Old Jack," who lived alone, four miles up the stage-road; Dr. Silverthorne, who lived with an Indian wife, seven miles from camp on

Cow Creek, and Mr. Campbell, eight miles up the river, who also has an Indian wife. We had no other white neighbors within twelve or fourteen miles.

We were surrounded by Indians, of course, this being an Indian country.

Concholoooloo, the head-chief of the tribe, lived very near us on the bank of the river. "Jim Mitchell," the other chief, has a rancherie and "porum boss," (council-house or theatre,) in the forest a mile and a half from the camp.

There was a marked improvement this year in the disposition of the Indians towards our party. The first two years, 1872 and 1873, they regarded us with more or less dislike and suspicion. This year there was an entire change in them. They seemed to have learned that we were their friends, that we had a genuine consideration for their welfare and were opposed to anything like tyranny or oppression, and when I passed over to them the thousands of salmon which we caught and had used for spawning, their hearts were entirely won over, and I think that we now have as individuals the confidence and friendship of the tribe.

They express their sense of the difference between us whom they call "the far-off white men," and the whites they have been accustomed to, by a saying they often use: Chocky yapitoo *chipkalla*; kelail yapitoo *challa*. "The white men near here, *bad*; the far-off white men, *good*."

At all events I thought I noticed this year an entire change for the better in their disposition toward us, though it should be remembered, that all the time in the depth of their hearts they wish that the whole race of white intruders were cleared out of the country, and if this much-desired consummation could be accomplished with impunity all personal considerations for us would be sacrificed to the common good.

Near our camp is the graveyard of their chiefs and magnates, where good Indians of the McCloud have been buried for centuries. The living members of the tribe are in constant fear lest we should dig up these graves for relics. This fear, caused without doubt by the casual remarks of our party on the subject, is well illustrated by the following unique petition brought to me one day, with great formality and seriousness. The Indian woman who brought it had employed some white friend to draw it up for her. It reads thus:

"SHASTA, September 11, 1874.

"This is to certify that Mrs. Matilda Charles Empire, one of the old settlers of Shasta County, is now on a pilgrimage to the graves of their ancestors, and she prays Commissioner Stone not to disturb any of her friends and relatives who have gone the way of all flesh, and thus they will ever pray; by

"Her husband,

"EMPIRE CHARLEY.

"MATILDA CHARLEY.

"Their sister,

KATE CHARLEY."

GAME.

The large game, I regret to say, is disappearing from this locality, owing, without doubt, to the approach of the railroad and the increasing facilities which it affords for hunting in this vicinity. I noticed a marked change even in the two years of my experience here. In 1872 it was a common thing to get a deer in the immediate vicinity of the camp: now it is a rare thing. During our stay on the McCloud fresh bear-tracks were continually seen, and several bears were killed: this year I have not heard of the killing of a single bear, and their tracks are not abundant. Only a few years ago grizzly bears used to occupy, almost undisturbed, a wild, rocky cañon not two miles from the site of our camp: now the grizzlies have all retired for several miles.

Smaller game, as quails and water-fowl, still remain, however; and there are minks and wild-cats enough left to make it very unsafe for poultry.

EXTRACTS FROM JOURNAL.

1874.

July 5.—Reached camp at 3½ a. m. All hands set to work on the fishing-ground.

July 6.—Made a corral for the cow. First haul of the seine. Visit from a Warm Spring Indian engaged in the Modoc war last year.

July 7.—Mr. Woodbury arrived with Ah Sin, the cook.

July 8.—Mr. Myron Green caught a salmon with a fly. Supplies arrived at noon. A busy afternoon.

July 9.—Visit from Conchooolooloo, the Indian chief. Mercury in thermometer, in the sun, 159°—in the sand near the house. Chinaman very sick.

July 10.—Mr. Woodbury killed a rattlesnake, making seven that have been killed in the neighborhood this summer. Launched the boat to-day. Target-shooting in the evening.

July 11.—The Chinaman went out in the boat and was carried over the rapids but not injured.

Sunday, July 12.—A party of us made the very steep ascent of the lower summit of Mount Persephone. Unpleasantness between the Chinaman and Indians. United States flag raised to-day.

July 13.—First photographs taken. All hands went to an Indian dance in the evening. Comet seen to-night for the last time in the evening here.

July 15.—Timber came to-day and we laid the floor of the new house.

July 16.—Bought cow and calf.

July 20.—Moved headquarters to-day to Brush Camp, out of doors. Felled several large trees for the bridge.

July 21.—Rattlesnake was killed opposite the house. Twenty minutes' exposure to the rays of the sun this afternoon cooked an egg.

July 22.—Blew up rocks in the river-channel, below the wheel, with giant powder.

July 23.—Thunder was heard to-day; there was a slight rain in the afternoon.

July 24.—Water from a strong sulphur-spring near by is used quite extensively in camp, and with beneficial results. The second pier in the bridge was placed to-day.

July 25.—After the day's work was done, a party started in search of a cave in Mount Persephone.

July 26.—A large limestone cave, forming a very handsome grotto, was found in the mountain. Two rattlesnakes were encountered.

July 27.—A little gold-digging was done to-day, and some gold found. A camping expedition was sent out to-day in search of poles.

July 30.—Camping expedition returned, having felled five hundred trees.

July 31.—Bridge across the McCloud was completed to-day. Quails very abundant around the house.

August 1.—A load of lumber having come yesterday, additional bunks were constructed, and other improvements were made.

August 2.—Nearly all the camp turned out to-day, it being Sunday, in search of another cave in the mountain, of which we had heard rumors. The cave was found after some difficulty, and extended through a long, winding passage-way, which ended in a chamber 50 feet high, 150 feet long, and 40 feet wide.

August 5.—An unusual number of Indians about the camp to-day. Took a photograph of Conchooolooloo, the chief of the tribe.

August 7.—Several minks were seen playing in the water, just in front of the house. One hundred and forty-seven salmon, weighing about a ton, were caught in one haul to-night.

August 10.—The dam across the McCloud River, obstructing the ascent of the salmon, was completed to-day.

August 13.—All hands at work to-day in the tent on the hatching-apparatus. The Indians fish a good deal in the river about this time, at night, diving, themselves, for the salmon with a hand-net, which they use in the water with wonderful skill.

August 16.—Made the ascent of the summit of Mount Persephone. Height found by aneroid barometer to be 4,100 feet above the level of the sea.

August 18.—An Indian woman came to the camp for protection, being pursued by an Indian, whose brother she had killed.

August 19.—The Indian in pursuit arrived in camp this morning, armed with a six-shooter. Danger of another murder. The Indian, after some flourishing of his revolver, was peremptorily ordered to leave the camp, which he did.

August 20.—Quails very abundant around the camp.

August 23.—Our poultry has been nearly all killed by minks and wild-cats.

August 25.—A thunder-shower at night.

August 26.—First ripe pair of salmon. About two hundred salmon caught at one haul of the seine.

August 27.—Water below the bridge is black with salmon, trying to pass it.

August 29.—Wild plums ripe and abundant.

August 30.—Another rattlesnake killed.

September 1.—A wind-storm blew down the large tent.

September 3.—Indians hold a large council in an immense underground council-house.

September 4.—The seine was caught on a rock in the rapids, and torn in pieces.

September 5.—A large salmon, fresh from the sea, was caught.

September 10.—Expedition for moss left to-day for Mount Shasta.

September 13.—A party of Indians, on a pilgrimage to the graves of their ancestors, arrived to-day, and presented a petition, requesting us not to disturb the bones of the buried forefathers.

September 15.—Large trout very abundant in the river, where the white salmon-eggs had been thrown.

September 19.—Water in the river getting too cold to bathe in, its temperature being at 50° in the morning.

September 20.—The eye-spots of the eggs taken the first part of this month are now very distinctly seen.

September 25.—The first shipment of the eggs was made to-day.

September 28.—Grand festival of the McCloud Indians at their underground council-house.

October 1.—Very violent and copious rain; the McCloud River rose a foot, and carried away a section of the bridge. Sent a second expedition after moss.

October 5.—Packed 750,000 eggs to-day.

October 6.—Sent second lot of salmon-eggs.

October 7.—Hear coyotes howling at night. Found some excellent raisins to-day, formed from grapes which had been accidentally left in the sun.

October 9.—Sent third lot of eggs by express.

October 10.—Another violent rain last night.

October 11.—Fourth lot of salmon-eggs sent off to-day.

October 12.—Very violent wind-storm this afternoon. The rainy season seems to have set in, although it is not expected till three weeks later.

October 13.—Fifth lot of eggs sent off.

SALMON-HATCHING ESTABLISHMENT, M'CLOUD RIVER, CAL. 471

Record of temperature at the United States fishery, McCloud River, California.

TEMPERATURE OF AIR.

1874.					1874.				
Date.	6 a. m.	3 p. m., shade.	3 p. m., sun.	6 p. m.	Date.	6 a. m.	3 p. m., shade.	3 p. m., sun.	6 p. m.
July 8	55	100	126	75	Sept. 9	37½	86	90	65
9	54	106	*138-9	78	10	38	76	98	60
10	68	100	123	74	11	54	77	99	65
11	58	102	112	82	12	46	88	100	69
12	64	97	112	74	13	46	96	108	66½
13	57	100	120		14	64	98	116	66
14	60	100	110	74	15	46	92	112	78
15	56	98	128	73	16	65	93	113	65
16	58	-95	107	80	17	30	90	100	70
17	49	93	113	80	18	64	90	110	70
18	51½	91	113	74	19	18	92	108	68
19		96	115	70	20	68	90	110	68
20	48	98	120	72	21	48	86	104	66
21	60	101	130½	80	22	43	84	100	67
22	58	100	129	70½	23	43	80	101	68
23	58	72	172	70	24	44	84	104	64
24	67	99	119	76	25	45			50
25	62	93	106		29		90	110	58
26		90	116	72	30	49		Cloudy.	61½
27		82	100	60	1.	40	64	Rainy.	59
28	62	87	98	68	2.	41	61		59
29	53	92	120	71½	3.	52	78	102½	59
30	63	94	114	72	4.	50	81	100	60
31	51	§92	106	73	5.	55	80	96	58
Aug. 1	50	90	112	73	6.	48	79	99	56
2	48½	90	102	68	7.	50	96	110	60
3	48½	89½	106	68	8.	53	94	115	68
4	48½	87	96	76	9.	54	80	91	64
5	52			67	10.	50	78	92	60
6	47½	93	104	68	11.	52	83	100	60
7	47½	88	102	72	12.	51	72	96	53
8	50	88	100	73	13.				66
9	50	90	110	66	14.	47	82	100	63
10	50	91½	108	74	15.	65	80½	100	63
11	48	86	95	74	16.	51	84	95	63
12	50	81	95	73	17.	51	73	82	61
13	53	85	100	74	18.	56	58	58	54
14	59	85	100	67½	19.	57	59	59	51
15	48	84	98½	69	20.	52	66	82	55
16	51	99	110½	74	21.	53			58
17	50	94	118	74	22.	53	51	63	56
18	52	96	117½	74	23.	51	56	56	53
19	50	90	100	69½	24.	47			46
20	46	84	105	69	25.	32	37	37	37
21	43	87	103	69	26.	40	42	42	40
22	43	88½	99	74	27.	41			43
23.		88	100	74	28.	38	52	74	43
24	50	84	106	74½	29.	35	50	87½	43½
25.	52	93	114	79	30.	35	57	90	42
26.	58	95	115	78	31.	35	57	90	42
27.	56	93	102	74	Nov. 1				45
28.	58	97	116	74	2	35			42
29.	52	95	115		3	38			53½
30.					4	50	51	54	52
31.	44	93	115	74	5	53	50	52	45
Sept. 1	64	89	108	73	6	33			47
2	67	93	118	68	7	42	45	45	45
3	48	100	122	73	8	46	50½	51	51
4	52			73	9	50	54	54	58
5	52	84	100	74	10	50	53	53	53
6	46	83	100	68	11	53	58	62	50
7	44	79	92	68	12	52			49
8	52	76	86	67					

* In sand, 157°.

† Thunder, with rain, all the afternoon.

‡ Cloudy.

§ 5 a. m.

472 REPORT OF COMMISSIONER OF FISH AND FISHERIES.

Record of temperature of McCloud River at the United States fishery, California.

Date.			6 a. m.	12 m.	7 p. m.	Date.			6 a. m.	3 p. m.	7 p. m.
			°	°	°				°	°	°
July	6.....		54	58	58	Sept.	3.....		52	57	56
	7.....		56	58	58		4.....		52	57	56
							5.....		52	57	56
							6.....		56	57	56
							7.....		52½	57	56
							8.....		53½	59	56½
							9.....		51	55	55
	8.....		56	60	58		10.....		49	54	54
	9.....		56	60	58		11.....		49½	54	54
	10.....		56	60	58		12.....		50	54	54
	11.....		56	62	60		13.....		50	55	55
	12.....		57	62	61		14.....		50	56	56
	13.....		56	62			15.....		52	57	56
	14.....		56	62	61		16.....		51	56	56
	15.....		56	61	61		17.....		51½	56	56
	16.....		56	61	61		18.....		50	56	56
	17.....		56	61	60		19.....		52	56	56
	18.....		58	60	59		20.....		57	56	56
	19.....			60	59		21.....		50	53	54½
	20.....		56	60	58		22.....		50	55	55
	21.....		55	62	60		23.....		50	55	55
	22.....		56	62	60		24.....		50	55	54
	23.....		56	58½	58		25.....		50		
	24.....		56	61	60		29.....			55	53
	25.....		56	62	(*)	Oct.	30.....		50	55	53½
							1.....		50	53	51½
							2.....		49	54	50
							3.....		50	53	52
							4.....		50	55	54
							5.....		50	54	53
	26.....			61	60		6.....		51	55	53
	27.....			60	58		7.....		50	55	53
	28.....		55	52½	57½		8.....		50	54	53
	29.....		55	59½	56½		9.....		51	54	53
	30.....		55	59	58		10.....		51	55	54
Aug.	1.....		54	159	58½		11.....		51	55	53
	2.....		54	60	58½		12.....		50	54	51
	3.....			59½	58		13.....		48	53	51
	4.....		54	59½	58		14.....		48	53	52
	5.....		54½		57½		15.....		49	51	51
	6.....		53½	58	57½		16.....		48	54	52
	7.....		53½	58	57½		17.....		48	51	51
	8.....		53½	58	57½		18.....		49	50	49
	9.....		54	58	57		19.....		49	51	50
	10.....		53½	58	57		20.....		48	49	49
	11.....		53½	58	57		21.....		58	49	50
	12.....		53	58	57		22.....		48	50	49
	13.....		54	59	58		23.....		49	50	49
	14.....		54	59	58		24.....		48		49
	15.....		53½	58	57½		25.....		44	43½	45
	16.....		53	60	58		26.....		42	43	43
	17.....		54	59	58		27.....		43		45
	18.....		54	59	58		28.....		44	47½	47
	19.....		54	59½	58		29.....		44	47	47
	20.....		54	59½	58		30.....		44	46½	46
	21.....		53½	58½	56		31.....		42	46	45
	22.....		53	57½	57	Nov.	1.....				46
	23.....		52	57	56		2.....		42		45
	24.....			56	57		3.....		44		47
	25.....		53	58	57½		4.....		47	48	47
	26.....		53½	58½	58		5.....		48	48	48
	27.....		54	59	58		6.....				47
	28.....		54	58½	58		7.....		44	45	45
	29.....		54	60	58		8.....		44	47	46
	30.....		54	59			9.....		47	40	47
	31.....		52½	58	58		10.....		48	48	48
Sept.	1.....		52½	57½	57½		11.....		49	50	50
	2.....		53	58	56		12.....		49		

* Thunder, with rain all the afternoon; rain during night.

† 5 a. m.

SALMON-HATCHING ESTABLISHMENT, M'CLOUD RIVER, CAL. 473

Temperature of water in hatching-troughs.

Date.	7 a. m.		3 p. m.		7 p. m.	
	Inlet.	Outlet.	Inlet.	Outlet.	Inlet.	Outlet.
Sept. 10.....	49	48	54½	56	54	59
11.....	49	49	56	56½	54	54
12.....	49	49	56	56½	55	55
13.....	50	50	57	58	56	56
14.....	50	50	57	60	56	58
15.....	51	50	58	59	57	57½
16.....	52	52	56½	58	56	56
17.....	51	51	56½	57	56	56
18.....	51½	51½	56½	58	56	56
19.....	50	50	56	56½	56	56
20.....	52	52	56	56½	57	56
21.....	51	51	56	56	54	54
22.....	50	50	55	56	54½	55
23.....	50	50	55	56	55	55
24.....	50	50	54	55	54	54
25.....	50	50				
29.....			54	53½	53	53
30.....	50	50	54	55	53	54
Oct. 1.....	50	50	53	54	52	53
2.....	49½	50	53	56	50	52
3.....	48	48	52	52	52	53
4.....	50	50	55	55	54	54
5.....	50	51	54	55	53	54
6.....	51	51	54	55	54	54
7.....	50	50	55	56	53	54
8.....	50	50	54	55	53	53
9.....	51	51	54	55	53	53
10.....	51	51	55	55½	54	54½
11.....	51	51	55	56	53	54
12.....	50	50	53	54	51	51
13.....					51	53
14.....	47	47	53	54	52	52
15.....	49	49	52	52	51	51
16.....	48	49	52	52	51	51
17.....	48	48	51	51	51	51
18.....	49	49	50	50	49	49
19.....	49	49	50	50	49½	49
20.....	48	48	49½	49½	49	49
21.....	48	48			50	50
22.....	49	49	50	50	49	49
23.....	49	49	50	50	49	49
24.....	48	48			49	49
25.....	44	44	43½	43½	45	45
26.....	42	42	43	43	43	43
27.....	43	43			45	45
28.....	44	44	47	47	47	47
29.....	44	44	46	46	45	45
30.....	44	44	47	47	46	46
31.....	42	42	40	40	45	45
Nov. 1.....	42	42			45	45
2.....	42	42			45	45
3.....	44	44			47	47
4.....	47	47	48	48	48	48
5.....	48	48	48	48	48	48

474 REPORT OF COMMISSIONER OF FISH AND FISHERIES.

Temperature of the Sacramento River, taken at Tehama bridge, for the month of May, 1874, at 3 p. m.

Date.	Temperature of air.	Temperature of surface.	Temperature of bottom.	Date.	Temperature of air.	Temperature of surface.	Temperature of bottom.
May 7.....	64	54	54	May 20.....	82	61	61
8.....	74	57	54	21.....	85	62	62
9.....	76	56	56	22.....	79	60	60
10.....	76	58	58	23.....	82	60	60
11.....	79	59	59	24.....	84	62	62
12.....	86	60	60	25.....	80	60	60
13.....	85	60	60	26.....	78	60	60
14.....	90	60	60	27.....	72	60	60
15.....	90	61	61	28.....	75	60	60
16.....	92	62	62	29.....	86	60	60
17.....	88	62	62	30.....	82	62	62
18.....	88	63	63	31.....	86	64	64
19.....	80	62	62				

Temperature of the Sacramento River, taken at Sacramento City, for the months of April and May, 1874, at 3 p. m.

Date.	Air in shade.	Air in sun.	Temperature of the surface.	Temperature of the bottom.	Date.	Air in shade.	Air in sun.	Temperature of the surface.	Temperature of the bottom.
April 9.....	74	80	56	54	May 6.....	60	66	57	57
10.....	54		54	53	7.....	58	91	57	57
11.....	62	68	54	53	8.....	73	78	57	56½
12.....	56	58	53	52	9.....	73	77	57	57
13.....	60		53	52	10.....	75	97	58½	58
14.....	62	81	53	52	11.....	76	98	61	61
15.....	62	85	54	53	12.....	83	110	62	62
16.....	66	78	54	53	13.....	77	85	62	61
17.....	67	81	55	54	14.....	81	95	62	61
18.....	70		55	55	15.....	80	100	63	61
19.....	70	75	56	55	16.....	87	107	63½	62
20.....	66	74	57	57	17.....	87	90	63	62
21.....	68	84	57	57	18.....	84	94	63	62
22.....	70	84	57	57	19.....	76	85	62½	61
23.....	78	86	57	57	20.....	80	No sun.	63	61
24.....	74	78	58	57	21.....	82	85	63½	61
25.....	68	74	57	57	22.....	72	No sun.	62½	61
26.....	69	96	58	57	23.....	82	106	64	62
27.....	76	81	58	57	24.....	81	85	63½	62
28.....	78	98	59	58	25.....	82	88	63	61½
29.....	69		59	57	26.....	75	83	63½	62
30.....	69	66	57	56	27.....	57	No sun.	63	63
May 1.....	65	87	57	56	28.....	73	85	64	62
2.....	75	78	56	56	29.....	78	91	64	63
3.....	76	97	57	56	30.....	83	102	64	63
4.....	64	70	57	56	31.....	77	83	64½	63
5.....	59	No sun.	57	56					

Catalogue of Collection to Smithsonian Institution, contributed in 1874.

- 356. Wyedardeeket. McCloud Camp. July 2, 1874.
- 357. Trout. McCloud Camp. July 15, 1874.
- 358. Wyedardeeket. July 8, 1874.
- 359. Catfish. Elkhorn River, Nebraska. June 8, 1874.
- 360. Wyedardeeket. McCloud Camp. July 5, 1874.

361. Trout. Lake Tahoe, California. June 11, 1874.
 362. Wyedardeeket. McCloud Camp. July 1, 1874.
 363. Wyedardeeket. McCloud Camp. July 4, 1874.
 364.
 365. Trout. McCloud Camp. July 10, 1874.
 367. Trout. McCloud Camp. August, 1873.
 368. Male salmon. McCloud Camp. July 12, 1874.
 369. Wyedardeeket. McCloud Camp. July 2, 1874.
 370. Fish. (sp?) San Francisco. June 20, 1874.
 371. Trout. McCloud Camp. August, 1873.
 372. Trout. McCloud Camp. August, 1873.
 373. Trout. McCloud Camp. August, 1873.
 374. Salmon. McCloud Camp. July 12, 1874.
 375. Trout. Lake Tahoe. June 11, 1874.
 376. Bass. Elkhorn River, Nebraska. June 8, 1874.
 377. Catfish. Elkhorn River. June 8, 1874.
 378. Female trout, caught with hook. McCloud Camp. July 16, 1874.
 379. Female trout, caught with hook. McCloud Camp. July 16, 1874.
 Weight $1\frac{1}{2}$ pounds, girth $9\frac{3}{4}$ inches.
 380. Catfish. Elkhorn River. June 8, 1874.
 381. Catfish. Elkhorn River. June 8, 1874.
 382. Female salmon. McCloud River. July 14, 1874. Weight 13 pounds, girth 15 inches.
 383. Wyedardeeket. United States Salmon Camp. Caught with hook. July 16, 1874.
 384. Catfish. Elkhorn River.
 385. Salmon milt. July 8, 1874. McCloud Camp.
 386. Catfish. Elkhorn River, Nebraska. June 8, 1874.
 387. Skin of female salmon, taken same day as 382. Eggs were much less developed than 382. Skin has a marked reddish tinge. Weight 22 pounds, girth 17 inches. McCloud River. July 14, 1874.
 389. Trout. McCloud River. July 15, 1874.
 390. Catfish. Elkhorn River, Nebraska. June 8, 1874.
 391. Trout. McCloud Camp. July 15, 1874.
 393. Bass. Elkhorn River, Nebraska. June 8, 1874.
 394. Female trout. McCloud Camp. July 10, 1874.
 395. Trout. McCloud Camp. July 10, 1874.
 396. Bass. Elkhorn River, Nebraska. July 12, 1874.
 397. Catfish. Elkhorn River. June 8, 1874.
 398. Crawfish. Santa Barbara, Cal. June 19, 1874.
 399. Trout. McCloud River, California. July 16, 1874.
 401. Wyedardeeket. McCloud Camp. July 4, 1874.
 402. Trout. Independence Lake, headwaters of little Truckee River. Spawn and milt, ripe. July 3, 1874.
 403. Trout. Independence Lake. These fish were spawning; there was snow about the lakes,

404. Trout; male. McCloud River. Handsome fish; weight, 2 pounds; girth, 2½ inches. July 17, 1874.

405. Salmon; male. July 18, 1874. McCloud Camp. Length, 27 inches; girth, 14 inches; weight, 6 pounds.

406. Salmon; male. July 18, 1874. McCloud Camp. Length, 30 inches; girth, 16 inches; weight, 8 pounds.

407. Young grilse. McCloud Camp. July 18, 1874.

408. Grilse. July 18, 1874. Length, 20 inches; girth, 11 inches; weight, 2½ pounds.

409. Small trout. July 18, 1874. McCloud Camp.

410. Small trout. July 18, 1874. McCloud Camp.

411. Alcohol bottle of salmonidæ. McCloud Camp. July 18, 1874.

412-416. Heads of salmon, all male, taken August 1, 1874, and packed in strong salt brine.

417. Male salmon. McCloud River. August 28, 1874.

418. Female salmon. McCloud River. August 28, 1874.

419. Male salmon head, taken at spawning time, September 3. McCloud River.

420. Female salmon head, taken at spawning time, September 3. McCloud River.

421. Male salmon, taken after ripe season partly over. Girth, 1 foot 3 inches; weight, 10 pounds; length, 30 inches; dark-colored skin. September 4, 1874. McCloud River.

422. Female salmon, partly spawned, taken September 4. McCloud River fishery. Girth, 1 foot 5 inches; weight, 12 pounds; length, 13 inches; beautiful spotted tawny skin; and unusually long for the size.

423. Head of a *very large* male salmon. Girth, little over 2 feet; length, about 40 inches. Caught in McCloud River, September 5, 1874. Looked as if it had come directly from the sea, the scales not being yet absorbed into the skin, as is the common rule among other fish taken here.

424. Large male salmon, from the sea, with scales upon him. Girth, 1 foot 9 inches; length, 3 feet; weight, 19 pounds; eyes very small; silvery, very thin and greasy skin.

425. Young trout. McCloud River. September 22, 1874. Very handsome, and with silvery scales.

426. Young trout. McCloud River. September 24, 1874.

427. Very large, fierce male salmon. McCloud River. September 26, 1874. Girth, 23 inches; weight, 30 pounds; length 42 inches.

428. Young trout. McCloud River. September 27, 1874.

429. Young trout. McCloud River. September 27, 1874.

430. Young trout. McCloud River. September 25, 1874.

431. Young trout. McCloud River. September 25, 1874.

432. Young trout. McCloud River. September 25, 1874.

433. Young trout. McCloud River. September 25, 1874.

434-435. Wyedardeeket. McCloud River. September 18, 1874.

436. Specimens of young salmonidæ. McCloud River, California. From September 1 to October 1, 1874.

437. Jar of various specimens from McCloud River Camp. Lizards, Poison lizard, (local name,) tree-toad, beetle, snails.

438. Trout. Soda Creek, Siskiyou County, California. September 12, 1874. Contributed by R. D. Hubbard.

439. Wyedardeeket skin and head. McCloud River, California. Eggs very little developed.

440. Wyedardeeket. McCloud River, California. United States fishery. Very large for this locality.

441. Water ouzel. (Sourciuny, Indian name.) McCloud River. United States fishery, California. October 17, 1874.

SECOND CALIFORNIA AQUARIUM CAR.

Under the auspices of the California fish commission, I left Charlestown, N. H., on the 4th of June, 1874, with a car-load of living eastern fish, and arrived in California on the 12th of June, after a journey of eight days.

Below will be found a tabulated statement of the results of the expedition.

SECOND CALIFORNIA AQUARIUM CAR, 1874.

List of fishes which arrived alive at their destinations, and the waters into which they were introduced.

Numbers started with.	Where procured.	Numbers deposited.	Place of deposit.
FRESH-WATER FISH.			
75 full-grown black bass, (<i>Micropterus salmoides</i> .)	Lake Champlain, Vermont....	73	Napa Creek.
24 small black bass, (<i>Micropterus salmoides</i> .)	Saint Joseph's River, Michigan	12	Alameda Creek.
18 full-grown glass-eyed pike, (<i>Stizostedion</i> .)	Missisquoi River, Vermont....	16	Sacramento River.
76 large Schuylkill catfish	Raritan River, New Jersey....	74	San Joaquin River.
Mississippi catfish	Elkhorn River, Nebraska	2	San Joaquin River.
71 horn-pouts, (<i>Ammurus</i>).....	Lake Champlain, Vermont....	70	Ponds or sloughs near Sacramento.
4 cans small silver-eels, (<i>Anguilla</i>)	Hudson River, New York.....	can.	Sacramento River.
450 small Penobscot salmon, (<i>Salmo salar</i>)	Penobscot River, Maine.....	305	Sacramento River, near Reading.
6 full-grown rock bass	Missisquoi River, Vermont....	4	Napa Creek.
SALT-WATER FISH.			
24 small tautogs, (<i>Tautoga onitis</i>)	Wood's Hole, Massachusetts..	23	Bay of San Francisco.
2 cans small salt-water eels, (<i>Anguilla</i>)	New York Harbor	1 can.	Bay of San Francisco.
150 full-grown spawning lobsters.	Massachusetts Bay	}	Great Salt Lake.
1 barrel of oysters.....	Massachusetts Bay		4
		1 bbl.	Great Salt Lake.

Times of starting and arrival of the second aquarium car.

Car left Charlestown, N. H., June 4, 1874.

Reached Albany, N. Y., Thursday, June 4, at 12 p. m.

Reached Rochester, N. Y., Friday, June 5, at 10.30 a. m.

Reached Suspension Bridge, N. Y., Friday, June 5, at 2 p. m.

Reached Niles, Mich., Saturday, June 6, at 4.20 p. m.

Arrived at Chicago, Ill., Saturday, June 6, at 8.30 p. m.

Left Chicago, Ill., Sunday, June 7, at 10.15 a. m.

Left Cedar Rapids, Sunday, June 7, at 8 p. m.

Arrived at Omaha, Nebr., Monday, June 8, at 10.30 a. m.

Left Omaha, Nebr., Monday, June 8, at 1 p. m.

Arrived at Elkhorn River, Nebraska, Monday, June 8, at 2.30 p. m.

Arrived at Grand Island, Nebraska, Monday, June 8, at 9.15 p. m.

Arrived at Big Springs, Nebr., Tuesday, June 9, at 8.15 a. m.

Arrived at Sidney, Nebr., Tuesday, June 9, at 11.30 a. m.

Arrived at Laramie, Wyo., Tuesday, June 9, at 7.10 p. m.

Arrived at Green River, Wyo., Wednesday, June 10, at 8.30 a. m.

Arrived at Evanston, Utah, Wednesday, June 10, at 3.20 p. m.

Arrived at Ogden, Utah, Wednesday, June 10, at 6 p. m.

Arrived at Elko, Nev., Thursday, June 11, at 8.45 a. m.

Arrived at Carlin, Nev., Thursday, June 11, at 10.15 a. m.

Arrived at Humboldt, Nev., Thursday, June 11, at 6.15 p. m.

Arrived at Wadsworth, Nev., Thursday, June 11, at midnight.

Arrived at Truckee, Cal., Friday, June 12, at 4.55 a. m.

Arrived at Sacramento, Cal., Friday, June 12, at 1.30 p. m.

Arrived at San Francisco, Cal., Friday, June 12, at 8.15 p. m.