rapid growth, indicating the adaptability of the waters of this bay to this development, together with the immense amount of shrimps, which abound in this bay and furnish abundant food, have, I must acknowledge, infused me with almost an enthusiasm to have this valuable fish brought here in sufficient numbers to insure the breeding of them. I have heard of some experiments having been made in breeding them artificially. If that can be done, we might, of course, bring them out as easily and in as great numbers as we now do shad, and my object in now writing you is to ascertain the probability of such an effort being successful.

If it cannot be done our only course must be to enlarge upon and extend the experiment of last year. The small fry can be obtained in the fresh-water heads of the Navesink, the Raritan, the Passaic, the Hackensack, and, in fact, all of those small rivers which flow from the New Jersey coast into the Atlantic and the bays emptying into it. Will you be so kind as to give the matter some thought and let us have the benefit of it? The shad are a success, and we feel satisfied that so soon as they shall have reached such numbers as to insure contact we shall breed them in abundance.

With much respect, I remain, yours truly,

S. R. THROCKMORTON,
Chairman California Fish Commission.

THE SELF-PICKER.

By FRANK N. CLARK.

NORTHVILLE, MICH., *February* 17, 1881.

DEAR SIR: Responding to your request for my opinion concerning the operations of self-pickers, I submit the following:

The name "Self-picker," as applied to any ova hatching apparatus yet devised, claiming the ability within themselves to completely separate the dead eggs from the living, is a misnomer.

All self-pickers, so called, are employed in hatching eggs by what is known as the bulk method, and the principle on which they are operated is the same in each. This principle is based on the supposition that all ova of confervoid growth, which are, for the most part, lighter than the live eggs, can be driven or separated from the latter by a properly adjusted current of water. But, when we consider that a small percentage of the dead eggs possess no greater buoyancy than the live ones, and consequently a current of water, strong enough to drive off all of the former, must necessarily take with it some of the latter, the impossibility of devising any apparatus that will be a complete self-picker or separater will be readily seen. Nevertheless, I consider the method of bringing forward the eggs in bulk far superior to any of the hatching-box or tray systems now in use. It is practicable, however, to develop

in bulk only such eggs the fry of which are able to swim out of the mass of eggs when hatched, or are light enough to be thrown out by the current of water. No objections on this score can be raised to this plan for hatching ova of the whitefish (*Coregonus albus*), or of the shad (*Alosa sapidissima*).

Of the several appliances which have been invented for hatching eggs by the bulk method, those most prominent, and which are undoubtedly the best, are the Mather & Bell cone, as improved by Major Ferguson, and the Chase hatching-jar.

The cone has been used exclusively for hatching the shad, while the jar has been confined to the whitefish work, with the exception of a single experiment with shad-eggs, where it was found to work very well, but must be tried still further before it can claim equality with the cone for shad work.

The cone, too, with the "Clark" gate attachment, would, in all probability, equal the jar for hatching eggs of the whitefish, but has not been sufficiently tested in this direction to warrant its introduction without further experiment.

The jar, although but recently introduced, has largely displaced the hatching devices for whitefish work hitherto in use, and, when its merits are more fully understood and appreciated, will, I think, entirely supercede all other appliances for the work in question. With its use one man can take care of 20,000,000 ova, and thus its great economy, as compared with any hatching-box ever invented, will be readily apparent. This great difference in its favor may be credited to the fact of its being so constructed and operated as to collect for the most part the eggs of confervoid growth at or near the surface of the mass of eggs, whence they are easily removed. Thus it will be seen that they are "partial separaters," but not "self-pickers."

But this partial separation of the dead eggs is a merit of no small proportions, as but little time is required for their removal when massed together, while the small percentage of dead eggs remaining unseparated is rendered powerless to harm the living ones by the constant current of water, which keeps the whole mass of eggs in ever-changing motion, and thus protects the latter from the contaminating influences of the former. It may be stated, as an actual fact, that where water of a temperature not exceeding 40° F. is used, in consequence of which the confervoid growth is comparatively slow, a large percentage of dead eggs may be allowed to remain or collect in a jar without jeopardizing the lives of the remainder; but the practice of removing all extraneous eggs collecting at the surface is to be commended.

The method employed by Mr. Chase, inventor of the jar in question, for removing these eggs, is to augment and thereby strengthen the current of water in the jar to that degree necessary to force the mass of eggs upward until the surface is on a level with the mouth of the jar, the gate being raised in the mean time to allow the surface eggs to float

off. But the most careful manipulation will fail to prevent the escape of many good eggs with the bad ones when this plan is pursued, as the line of separation between the two is not distinctly drawn.

I have found that a great saving of time, as well as eggs, can be effected by using a glass siphon to draw off the surface eggs. I have also used the siphon very successfully while operating the cone in shad hatching. No nicety need be observed in this process, as all eggs thus separated can be placed in a separate jar, when, in a few moments, a solid layer of eggs of confervoid growth will collect on top and can be readily siphoned away unattended with the loss of any good eggs, while the latter can remain in the jar to be manipulated as before when necessary. Other ways of assisting the jars to eliminate the extraneous eggs have been tried, but I have found the siphon plan to be by far the most expeditious and need not result in the loss of a single good egg by throwing away. This plan, then, consists essentially in collecting the surface eggs from the jars as often as may be necessary or desirable and condensing the same into one or more jars, from whence the most of the dead eggs can be removed without disturbing the good ones; by thus completing, with the aid of the siphon, the natural operations of the jar in separating the bad eggs from the good ones, the tedious and expensive process of picking out the dead eggs with nippers is done away with.

In any method of incubating eggs wherein they are stationary, as with the hatching boxes and trays, a slimy coating will be found adhering to the eggs which must be washed away as often as may be necessary; and for the same reason, the trays, boxes, and troughs also will require an occasional cleaning. And again, when the eggs are hatching, the trays require a daily manipulation to dislodge a portion of the fry and shells which will not escape through the meshes. All this work is unnecessary when the jar is used; the constant motion imparted to the eggs by the current of water keeps them bright and clean, and when hatching the fry and shells are, by the upward current, drawn out through the mouth of the jar into a tank for their reception, the gate at the mouth of the jar being removed during the hatching season.

The following suggestions may be of service in operating the jar:

It should be full of water, and, with its accessories, in position and in running order before the introduction of the eggs; but, while they are being introduced, it is better to interrupt the water supply of the jar being filled, which will prevent the eggs from flowing against and clogging the wire gate.

The rubber connecting-pipe should extend down inside the glass tube below the level of the water in the jar, to keep the water free from air-bubbles.

Eggs are sometimes found bunched together on their arrival from the spawning grounds; these should be broken up before their entrance into the jar, as the movement of the water therein is too gentle to accomplish this end.

The little projections or feet at the conical end of the glass tube should be accurately ground so as to compel a uniform current to flow from all points of the base of the tube. The capacity of the jar in question may be stated as 150,000 eggs of the *Coregonus albus.*

At the present writing, I have a jar containing 40,000 eggs of the whitefish, which are hatching very rapidly. These are the oldest eggs on hand, and their speedy development was brought about by an accident. The main conducting pipe sprung a leak, which interrupted the water supply of the jar for a few moments only; but as soon as the water was turned on again from another pipe, these eggs immediately began hatching by the thousands. This shows that when the eggs are nearly developed, their constant movement in the jar must not be checked if it is thought advisable to detain the appearance of the fry for the longest possible period. These eggs, however, were nearly mature, and the fry therefrom are lively and vigorous.

Yours, very truly,

FRANK N. CLARK.

Prof. S. F. BAIRD,

U. S. Commissioner of Fish and Fisheries, Washington, D. C.

COAL ASHES AS A MEANS OF RAISING MACKEREL IN PURSE SEINES.

By S. J. MARTIN.

Sometimes, when there is a large school of mackerel in the seine, they are heavy on the bottom of the seine, so that it cannot be easily handled. In such a case heave a bucket of coal ashes in the seine, and that will bring the mackerel to the surface. Captain Coas, of schooner John S. McQuinn, told me he had three hundred barrels of mackerel in his seine and they lay so heavy on the twine that he could not move the seine with twelve men hauling on the twine. He threw a bucket of coal ashes in it, the mackerel came to the surface, and they could then easily haul the seine. All the vessels that have tried it say it works well. The cook saves the coal ashes.*

METHOD OF USING WILLARD'S PATENT POCKET FOR MACKEREL.

By S. J. MARTIN.

Capt. S. J. Martin, Gloucester, Mass., writes in his journal, under date of June 30, 1881:

"I will explain how *Willard's Patent Pocket* is used for mackerel. In the first place, there are two out-riggers 9 feet long and 4 inches through;

*NOTE.—Ashes have been used, so Mr. Merchant tells me, for several years, but is thrown outside of the seine instead of into it, as Captain Martin thought. The object is to frighten the fish by making the water white, when they rise to the surface. The same result is obtained by the menhaden fishermen by giving a few quick turns of the propeller. The fishermen call it "whirling them up."—J. W. Collins.