minutes at a time without resting half an hour to take breath

A day or two after the death of the weakfish, kingfish, and blackfish, the codlings began to go. Every few minutes through the day my assistant was scooping out dead fish Still I could not detect the cause, but I came to the conclusion that when blackfish and codlings (the toughest of all aquarium fish) die the reason ought to be discovered

All of these fish, from their first illness, had been fed on the very choicest of marine diet—soft crabs, shrimp, hard and soft clams, and even oysters and scallops. The codlings would churn the surface of the water when fed on soft crab, so keen were their appetites, and yet a minute after they would retire to the bottom of the tank, straighten out, and die I watched the codlings with painful anxiety, for I began to fear that an epidemic was spreading through the entire range of tanks, and that in a few days all the fish would be lost. I had noticed that when a codling began to die it lost its rich colors and took on a sickly brownish white color, and that its death ended in a quivering and spasmodic action, after which it would straighten out and become rigid. These are the exact symptoms of smothering Yet how could these fish die of suffocation when I was pouring oxygen into the water so rapidly that the water was of a milky color, and everything was silvery with globules of air?

Again I determined to make another examination, this time under a microscope, and placing a minute portion of a gill of one of the dead codlings under the glass, I was astonished to find it literally packed solid with very minute marine leeches, every one of which was gorged with blood taken from the gills of the fish. Here was the secret; these thousands of minute parasites had so packed the delicate breathing apparatus of the fish that they had died for want of oxygen, in other words, had smothered.

Evidently these parasites were fast spreading from tank to tank; the only way to stop this was to lock up the water in the affected tanks, and thus stop the spreading of the parasites through the entire circuit of tanks and into the storage reservoirs. The few codlings that still remained alive were treated the same as the eels, and with like good results. The locked up water was filtered through a large filter, consisting of blankets, sponge, animal charcoal, and fine sand, after which it was allowed to pass into the reservoirs. I afterwards discovered that these parasites had been introduced into the tank through the medium of twenty five small Eastern lobsters that. in all probability, through long confinement in "cars" and smack wells, had become infested with parasites. All these lobsters died shortly after being introduced in the tank.

Correspondence.

The New Color Printing Process.—Honor to whom Honor is Due.

To the Editor of the Scientific American:

In your issue of June 29, you repeat in an article with the title of "A New Process of Simultaneous Color Printing," certain statements which in a similar form have fallen under my eye at least a dozen times in various journals within the last six months.

So long as these statements were confined to the regular daily or weekly journals, and were referred to as items for the casual reader, I left the misstatements they embodied unnoticed, although always in the possession of facts to correct them. But now as I observe their appearance in your well informed technical journal—a journal which I am happy to say is considered an authority in all technical matters by its readers—I beg to be permitted to say what I know about the very valuable and ingenious invention referred to.

The process of polychrome printing for producing complicated color effects in one single impression—the printing from a kind of mosaic plate or ground—was the idea of many an inventive mind during the last century. Senefelder, the genial inventor of lithography, was, so far as I am aware, the first to conceive the idea of reproducing oil paintings, etc., by mechanical means, and in the course of his various experiments he also invented a process which he called mosaic printing.

In the collection of lithographic incunabula at Munich there is still to be seen "an original mosaic plate, consisting of minute sticks of color, very carefully put together, with finished and unfinished impressions taken from it." (See Ferchl, *Geschichte der Errichtung*, etc., München, 1862.)

As Senefelder died in 1831, his priority is established beyond dispute. Experiments in this direction were followed by a Berlin artist, Liepman, who, in the first half of this century, produced reproductions of oil paintings, especially portraits, by this process, which were of wonderful accuracy. It seems, however, that he was only partially successful—that he was unable to perfect the process so as to make it practically useful, and carried it only to the experimental stage; for after his first successful reproductions, of which several were regularly published, we hear no more of it. Liepman also published a book describing his invention and entitled "Der Oelgemulde Druck," Berlin, L. Sachse & Co., 1842.

Similar attempts were also made in the United States. A firm in Maiden lane or in John street, New York, whose name I cannot now remember, published some maps printed from mosaic blocks, a number of years ago; but the next person prominently identified with this invention was one Julius Greth, also a German, who began experimenting with the process about the year 1870

He succeeded in interesting successively various wealthy enthusiasts in the enterprise, leaving one for another however as fast as their enthusiasm cooled His last financial assistant in this way was Mr Otto Radde, an able and energetic Hamburg merchant, who not only invested money in the enterprise, but who became himself thoroughly interested in the principles of the process. When Mr Radde found, as he did shortly, that Mr. Greth was at his wits' end, and that he was wholly unable to perfect the practical applications of the process, they parted company Mr Radde then struck out for himself and continued the experiment, assisted by Mr C R. Linde, a technically trained architect and engineer. By bringing to the enterprise trained skill and energy that has overcome all obstacles, and by the employment of a not inconsiderable fortune, Mr Radde succeeded, about the year 1876, in making the process of real practical value It was about this time that Mr Radde wrote to me on the subject and sent me many beautiful specimens of his work, and offered his American patents for my consideration

After perfecting his process Mr. Radde organized a color printing establishment in Hamburg and one in Paris, the latter on a very extensive scale. In 1879 he sold the latter establishment to Mr. W. G. White. I observe in the technical papers in Germany that Mr. Greth now claims that he has greatly improved on Radde's results.

I will only add that the description of the process given in your article is in the main correct, and that I have no interest in the matter other than that of a color printer who takes a lively interest in whatever tends to further develop our beautiful and important art. I believe that a great field of usefulness can be found for this new process in this country, and now that it is being brought to the attention of the American public I desire that at least the tribute of honorable mention should be given to Mr. Otto Radde and Mr. C. R. Linde for their really important contribution to the practical worth of the invention.

LOUIS PRANG.

Boston, June 25, 1880.

Another Theory for the Oil Tank Explosions.

To the Editor of the Scientific American:

I notice in your paper of July 3, 1880, an article headed "Cannonading Oil Tanks," under which you advance a certain theory as to the probable cause of the frequent oil fires from lightning.

It is unquestionable that at all times a certain amount of gas or vapor escapes from such a body of oil, but that such a column, or "vapor rod," as you term it, should act as a conductor of electricity, we think is quite incorrect.

We give you our opinion, not as a scientist, but from a practical point, or, rather, from that which observation has led us to believe.

Perhaps all of your readers may not be familiar with the facts, therefore it will require a little preliminary explanation

Connected with each of these large *iron tanks* are a great number of *iron* pipes, leading oil from great distances and from different points into the tanks, the pipes ending abruptly within the tanks, which are closely covered, except at these openings or hatches in the upper parts of the tanks, where the pipes are admitted.

Now to illustrate, suppose a powerful currect of electricity conducted by a rod of iron to a point where the rod terminates in the air—what is the result? A stream or sparks of fire are produced from the end of the conductor.

Just so in the case of oil tanks; at some point along these pipe lines the lightning has come in contact with some one of them. That which might be expected is just what does occur: the pipe line, acting as a conductor, leads it directly to and inside of the tank, where, reaching the end of the iron line, sparks are produced, and, of course, from the nature of the gas contained in the tank above the oil, an explosion and terrible fire is at once produced.

You say, "Ordinary buildings, when properly provided with rods, are comparatively safe, etc., and that structures of iron, simply resting on the ground without rods, are always exempt from electrical damages. Such structures always present a continuous body of conducting material for the free passage of electricity to arth. Why is it, then, that iron oil tanks form such conspicuous exceptions to our common experience with lightning? Rods put on other structures save them; but rods have been put on oil tanks, masts with rods have surrounded the tanks, but the tanks were exploded by lightning all the same."

Now this, together with other things I will mention, just helps to support our theory.

In the first place, we doubt whether any one can show an instance where lightning struck a tank direct. If such an instance should occur, what would be the result? Just as you have stated above, the iron covering would furnish a perfect conductor to the earth.

Why did not all those rods on and around the tanks protect them? Because the lightning did not come at those points (if it did, it would, of course, be conducted into the earth), but it came from other points, by the iron-pipe lines, directly into the tank where the explosive matter was located.

To further prove this theory, I will give an example that came under my own observation. Lightning struck a large oak tree, possibly fifty rods distant from an oil well, at which was a wooden tank capable of holding about 150 barrels; from another well, possibly forty rods distant, an iron pipe led the oil to this tank also Immediately after the tree was struck this tank was on fire. Fortunately but little oil was in the tank, and before the fire had consumed the gas sufficient to reach the oil (as there was but little chance for air), wet blankets were placed over the hatch, and the fire smothered out No signs or marks of lightning could be traced, either about the derrick or on the building with which the tank was closely housed, or on the closely fitting cover containing the hatch. It seemed positive that the line conveyed the electricity into the tank, thereby igniting the gas. Possibly this theory is not correct and I would be pleased to see anything further upon this subject.

F. G. SACKET,

Knox P O, Clarion Co, Pa. July, 1880.

Oil Tanks Struck by Lightning.

To the Editor of the Scientific American:

In your issue of July 3 you say that 'lightning is peculiarly attracted by iron oil tanks, causing disastrous fires." This seems contrary to our experience as well as our philosophy The tank struck here June 11 was not an iron tank, but was one of the old fashioned tanks with wooden and gravel tops, and iron sides only. Many iron tanks were destroyed here at that time, but they were not ignited by lightning.

Your theory about the ascending column of vapor attracting the electric current has no doubters in these parts; but we fail to see why the lightning would not leave the oil vapor and oil if such a splendid conductor as a 20,000 barrel oil tank, built entirely of boiler iron and sunk well into the ground, was interposed, especially if the iron tank was connected, as tanks in this country are, with pipe lines many miles in length, making the best kind of a ground connection. B.

Titusville, Pa, July, 1880.

To the Editor of the Scientific American:

I notice your article about lightning being attracted by the iron oil tanks. The remedy for this has been found long since. The use of the iron top instead of wood. There has never been a tank of oil with iron top burned by lightning.

D. B. MASON.

Pittsburg, Pa., July, 1880.

The Oil Tank Question.

To the Editor of the Scientific American:

I have read your remarks referring to our late oil fire here, and giving a reason or explanation of the cause of it. I think you are out of the way in your statement, for the vapors from petroleum are oftentimes heavier than the atmosphere and rather seek the ground. Practical refiners always fear this most in and about a refinery, as these vapors hugging the ground are frequently drawn toward their furnace fires and lead to fearful explosions. Then the tops of these iron tanks are generally if not always tight, it being as necessary to keep *out* rain as to keep *in* the oil and vapor. In this particular instance the lightning struck this tank at 7 o'clock in the morning, before the sun could have generated any vapor to speak of, and these tanks are often struck in winter time, when the atmosphere is not warm enough to cause the vapors to be generated. Then, too, why is it that iron tanks with iron tops are not struck by lightning, while those of wood tops (covered with turf) are. I am anxious to get at the cause, and have written this solely to bring out more thought on the subject. C. M. C.

Titusville, Pa., July, 1880.

The Relative Cost of Motive Power.

Mr. Bissinger, M.E., at Carlsruhe, Germany, gives the following results as obtained in his examinations of the several motors in regard to the relative cost per horse power for each hour. It will be observed that the examination pertained principally to small motors.

The relative cost per effective horse power per hour is as follows:

100	horse power	steam engine	7·6
2	"	"	44·3
2	"	Lehmann's caloric engine	26·5
2	"	Hock's motor	40·0
2	"	Otto gas engine	26 4
2	"	Otto Lang gas engine	26 4
2	"	Schmidt's hydraulic motor, supplied with water from the city water works	95 00
2	"	obtained by horses and a gin	45·00
2	"	obtained by manual labor	200 00

Otto's gas motor and Lehmann's caloric engine are the cheapest of the small motors, but are, nevertheless, four times as expensive as the 100 horse power steam engine.

A New Photo Emulsion.

Dr. Vogel writes to the *Photographic News:* "I have a new emulsion with remarkable qualities. It combines the advantage of gelatine emulsion (high sensitiveness) with the advantages of collodion emulsion. It appears to keep any length of time, and, best of all, it may be poured like collodion upon the glass, drying as quickly as the latter. The plates are developed, intensified, fixed, and washed exactly like collodion plates, and dry like these. Moreover, the film may be exposed in the camera seven minutes after preparation and before drying. You will be glad to hear that several of our Berlin photographers—Prumm, Schaarwachter, and Reichard—have tried the emulsion, and reported upon its success to the Society for the Advancement of Photography. You may smile over all these wonderful things, but they are so convincing to me that I am seriously thinking of making the emulsion on a large scale."