How to Pack Drugs and Chemicals for Export.

The following suggestions will be found of practical value:

1. Salts should be put in stoppered glass bottles or packed in casks, if sent in large quantities. Casks used for hygroscopic salts should be lined with oil cloth or parchment paper. Salts should never be packed in tin boxes or in paper only.

2. The glass stoppers of all bottles containing either liquids or dry substances should be greased with a little vaseline in order to avoid any difficulty in removing them.

3. Parts of plants, such as leaves, roots, etc., should be packed in sacks, and these again in cases; very delicate drugs in tin boxes. Vegetable powders should be packed in hermetically closed glass bottles or tin boxes. Drugs which occupy much space should be pressed as much as possible before being packed, especially if the shipping freight is calculated according to the bulk of the goods.

4. Boxes and cases should be lined with zinc, or where this is too expensive a strong and good oil cloth will usually be sufficient.

5. Although the utmost care is necessary in packing, yet packing materials such as hay, straw, etc., should be used as sparingly as possible, as duty has usually to be paid for the weight of these as well as for the goods themselves.

6. Cases should be secured by iron bands, and it is always desirable that the weight and volume of cases should be as small as possible.

7. Acids, caustic or inflammable substances must be packed according to the regulations of the different railways by which they are transmitted prior to shipment. As a rule stone bottles are best for acids and ammonia, and glass or tin vessels for volatile substances. All these should be closed by corks saturated with paraffine, and then wrapped in sail cloth, which, with the string securing it, should also be soaked in paraffine.

8. Acetic acid may be safely conveyed from place to place in carboys of 5 to 10 gallons capacity.

9. Liquor ammonia should never be put into iron vessels.

10. Vessels containing volatile substances should never be quite filled.

11. As acids and caustic and inflammable substances are conveyed on the decks of sailing vessels only, the cases containing them should be well closed, and the address, mark, number, etc., be such as will resist sea water.

12. Liquids should not be packed in the same case with dry substances.

13. Valuable or expensive chemicals, such as ethereal oils and essences, should be packed in strong tin vessels and closed with corks saturated with paraffine as before described.

14. The weights and measures of the country to which the goods are sent should always be used, to avoid loss and inconvenience.

15. Besides observing these rules for packing, consigners of goods should be thoroughly acquainted with the customs tariffs and regulations of the countries to which they are sending, as pecuniary loss and inconvenience may occur from ignorance of them. For instance, if a case contains various substances, the duties on which are different, it is usual in some tariffs to calculate the duty of the whole of the contents of the case or at least of the packing materials at the highest rate. The importance of packing together goods upon which the customs tariffs are similar is self-evident from this.

16. In cases of urgency small quantities of any substance suitable for such transmission, *e. g.*, quinine, antipyrine, salicylic acid, etc., may be sent as patterns without value, and thus avoid the delay caused by the customs office.—*C. Monheim, Chem. Zeit.*

Redevelopment of Thin Negatives.

Mr. C. F. Cooke, of Wilkesbarre, Pa., in an article received too late for insertion in the "International Annual," gives a formula for redevelopment of thin negatives, which he has used with great success, as follows:

STOCK SOLUTION NO. 1.

Mercury bichloride	80 grains.
Water	10 ounces.

NO. 2.

Iodide potass	50 grains.
Water	6 ounces.

NO. 3.

Bromide ammonium	50 grains.
Water	6 ounces.

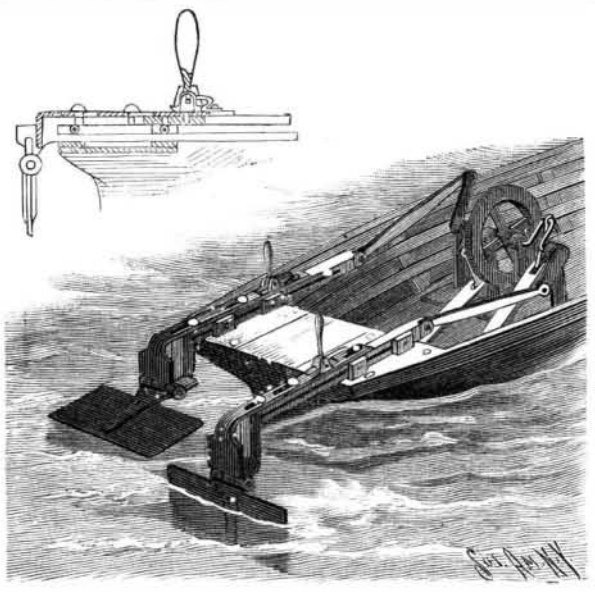
NO. 4.

Hyposulphite of soda, saturated solution, a few drops at a time, till red precipitate is just redissolved.

First dissolve the mercury, and then add Nos. 2, 3 and 4 in order. For redevelopment take of stock solution one ounce, and of water one ounce, and after thorough washing, proceed as in ordinary developing.—*Bulletin.*

A BOAT PROPELLING AND STEERING DEVICE.

By means of the attachments shown in the illustration a boat may be driven forward or backward, and readily steered, by foot power, or by the operating of a crank by hand. Affixed to each side of the stern, near the rear seat, is a keeper plate in which slides a longitudinally and horizontally slotted bar, extending out beyond the stern, each slide bar having a depending end, in which is pivoted a paddle. The paddles are secured to the slide bars by straps, which project above the pivotal point, and are adapted, as shown in the small sectional view, to engage the depending end



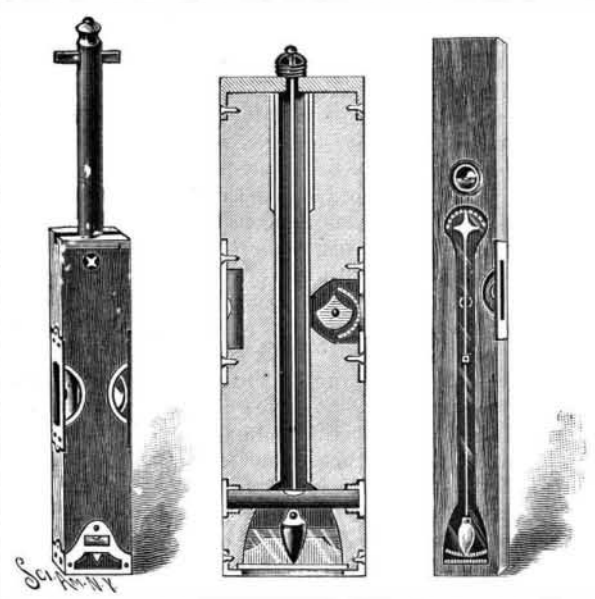
REHM & MARX'S PADDLE DEVICE FOR BOATS.

of a plate held to slide on the slide bar, by which the paddles are adjusted to move the boat forward or backward. When the plates are adjusted as shown in the large view, their depending ends are in the rear of the stops of the paddles, which will thus be held in a vertical position to push the boat ahead as they are moved backward, the paddles turning up edgewise as they are drawn forward, but when the depending ends of the plates are in front of the paddle stops, as shown in the sectional view, the paddle will operate to force the boat backward. Each adjusting plate has, near its forward end, lugs, in which a lever is pivoted within convenient reach, and by means of which the plate may be readily moved forward or backward upon the slide bar, and secured in place to hold the paddles in proper position for the forward or backward movement of the boat, or to prevent one of them from being operated at all, the latter feature affording great facility in steering the boat. The front ends of the slide bars are pivotally connected by pitmen with the cranks of shafts on opposite sides of the boat, the shafts being turned by pedals, which also turn a central shaft carrying a balance wheel, or the cranks may be arranged for operation by hand. To insure the easy working of the slide bars, rollers are arranged in the slots of the bars, by which the friction is reduced to a minimum.

Further information relative to this invention may be obtained of the patentees, Messrs. John Rehm and Ferdinand A. C. Marx, Westchester Avenue and Bronx River, New York City.

A COMBINED PLUMB AND LEVEL.

In this improved device, as shown in the illustration, the left hand figure represents a face view, with a



GARNER & CONNAUGHTON'S PLUMB AND LEVEL.

raised extension, the middle figure being a central sectional view, while at the right is shown a modified construction. The sides of the stock form straight edges, and at its lower end is a mortise in which plays an inclosed plumb bob over a glass plate provided with graduations, visible through an opening. The bob is also visible through side glasses, through which likewise may be seen a removably secured spirit level set transversely in the stock, the cord by which the bob is suspended being seen across the level. A short steadying rod projects into an opening in the upper part of the bob, to prevent its rotation and permit a limited swinging motion, and the bob cord extends up through a central recess or channel in the stock, a tubular extension being also supported to slide in the stock, through which the cord may be passed, to be secured to its cap, around which the cord may be wound when the tube is lowered into the stock. There are guide lines on the stock and on the extension, whereby the latter may be set accurately, and the extension has an arm or cross bar whose ends are in line with the straight edges of the stock, adapting the device for use on a longer surface than when the extension tube is down in the stock. At one edge of the stock is a spirit level, and in its opposite edge is a swinging gravity level, the weighted pointer of which is seated in a mortise having glass top and side plates, the latter marked with graduations. In the modified construction shown in the figure at the right, the recess for the bob cord is mortised in the face of the stock and covered by a glass plate, the suspension device being a pivoted bar having at its upper end a pointer registering along a graduated scale.

For further information relative to this invention, address the patentees, William J. Garner and Thomas Connaughton, Latourell Falls, Oregon.

Production of Copper in the United States.

Census Bulletin, No. 96, relating to copper production in the United States, has been prepared by Mr. Charles Kirchhoff, special agent, under the supervision of Dr. David T. Day, special agent in charge of the Division of Mines and Mining, of the Census Office. The report shows the United States to be the largest producer of copper in the world, its product for the year 1889 being 226,055,962 pounds, or 113,028 short tons. The total expenditures involved in this production were $12,062,180, of which there was paid in wages, $6,096,025; in salaries, $120,896; to contractors, $334,443; for materials and supplies, $4,067,970; and for taxes, rent, etc., $1,442,846, the total capital invested being $62,623,228, and the total employes, exclusive of office force, 8,721.

The copper product of the United States was as follows, in pounds, in the calendar year 1889:

	Pounds.
Arizona	31,586,185
Michigan	87,455,675
Montana	98,222,444
New Mexico	3,686,137
Colorado	1,170,053
Idaho	156,490
Nevada	26,420
Utah	65,467
California	151,505
Wyoming	100,000
Vermont	72,000
Southern States	18,144
Lead smelters and refiners	3,345,442
Total	226,055,962

During the last ten years, Arizona and Montana have made wonderful progress in the mining and production of copper, and to-day Montana, as will be seen from the above statement, leads all other States in this production, its product exceeding that of Michigan (which has heretofore been the leading producer) by 10,766,769 pounds.

American Screws in England.

Another industry, of an important character, is about to be introduced into Leeds. For some time past, says *Iron*, the American Screw Company, of Providence, R. I., has had in contemplation the establishment of a screw factory in this country, and circumstances being now favorable for the enterprise, Leeds has been selected as the industrial center offering the most advantageous conditions. An eligible site has been obtained in Leeds, viz., that of the Old Perseverance Iron Works, in Kirkstall Road. It is proposed to cover the frontage to Kirkstall Road to the extent of 100 feet, and to carry the building back for 344 feet, with a width (over the greater part of the latter) of 80 feet. When the time for extension arrives a duplicate of this building will be erected; and when this has been done, the two buildings running backward from the road will be separated by a yard 40 feet in width. The screws manufactured will be exclusively of the kind used by joiners and carpenters, and they will be of the English pattern. The machinery for the factory will come from America, and be adapted to the requirements of the trade in this country. The screws are packed in paper boxes, and these, together with the necessary labels and trade marks, will at the outset be procured from English firms; but the company intend eventually to make the boxes on their own premises, and will, in all probability, print the labels and trade marks there likewise. The finished wire used in the manufacture of the screws will also at the start be obtained elsewhere; but the scheme of the company includes the construction of wire mills and annealing furnaces alongside the screw factory.

Nature's Fireworks at Sea.

The steamship Pathan arrived here recently from Japanese ports with the first cargo (938 tons) of summer tea. Capt. Roy reports having witnessed several remarkable meteoric showers on the Atlantic. The shooting stars were of unusual size and brilliancy. Nearly all of them looked as large as Jupiter appears to be, and at least a dozen left in the sky bright flashes that lasted from ten to twelve seconds. Some few were so luminous that they lit up the ship like electric lights. The rain of stars seemed to come from the vicinity of the Great Bear. Its course appeared to be from north to south and south-east.

On Aug. 1, just after leaving Gibraltar, the Pathan ran into an electric storm, preceded by heavy squalls. The tip of every yard arm and mast was adorned with globes of electric fire. They jumped from point to point, ran up and down the rigging, slid along the stays, ascended and descended the halliards, playing such a game of tag as Capt. Roy had never before seen in his long experience in southern seas.

THE BREEDING HABITS OF THE SKATE.

BY WM. P. SEAL.

An interesting observation has recently been made in the aquaria of the United States Fish Commission, at Washington, on the common or "barndoor" skate (*Raia laevis*), which, though not complete, shows a very long period of gestation and incubation.

On November 1 last a single skate of this species was received among a lot of fish brought from the Wood's Holl station by the commission's steamer Fish Hawk, on her return to Washington. The skates do not usually live well in aquaria (in small tanks at least), but this one being not very large—about fifteen inches from tip to tip—appeared to be well satisfied with the conditions, and ate with avidity, catching small fish, or taking them from the hand of the attendant. On January 16 it laid an egg, and within a few days laid six more. It was thought at the time that as there was no male present, and it had been in the aquarium two months and a half, there was small probability of the eggs being fertilized. It was with considerable astonishment, therefore, that on May 12 the attendant, Robert Tunbers, a very observing man, found that they were undergoing development, and that by holding them up to the light the young skates could be plainly seen moving about. The accompanying sketch by Mr. H. E. Baldwin, a draughtsman of the commission, gives a very satisfactory view of the young skate at this period.

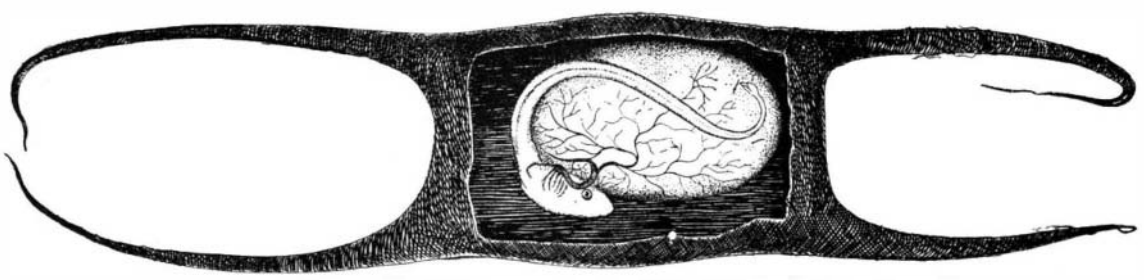
To make the drawing it was necessary to open an egg, and this was done by cutting it open on three sides, leaving one side to act as a hinge. The shell was filled with a thin but somewhat viscid fluid, in which the little skate moved freely about while the drawing was being made. When the picture was finished the egg was closed up and replaced in the aquarium. More than two weeks after this the little fish thus rudely disturbed, in the interests of science, was found to be still alive and apparently not at all the worse for it. It seems impossible that the salt water should not have found its way into the egg through the opening, and yet, on the other hand, the pressure may have sealed it up very tightly. At this point the egg disappeared, and a very interesting observation was brought to a close.

The hatching of the remaining eggs was awaited with the greatest interest. Another misfortune awaited, however, for before the absence of any of them was noticed they had all mysteriously disappeared like the first one.

This was a very great disappointment, of course, and a solution of the mystery was sought, but no trace of them was ever found. It was surmised, however, that as they had been transferred to an aquarium which had no cover over it, they were pulled out by the rats infesting the place and carried off into their holes to be eaten. As the eggs, owing to the air forced into the water, sometimes became so covered with the globules as to become buoyant and float to the surface, this seems to be a reasonable conclusion, especially as the rats are known to capture fish, snails, etc., from the tanks when opportunity offers.

On the 16th of June, when the eggs were last noticed by the writer, the hatching was apparently still some time off. It is possible that the period covered from the laying of the eggs to their disappearance may not represent a normal development, but there may have been a retardation from some cause. It appears that but little is known of the habits of the skates.

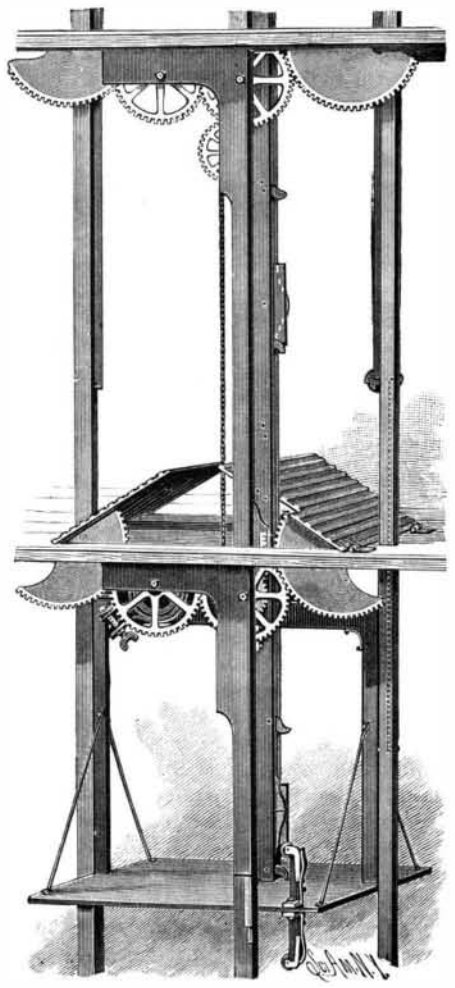
Vinal Edwards, an observing collector of the United States Fish Commission at Wood's Holl, Mass., has found skates' eggs in great numbers on sand bars, at low tide, all standing upright, with one end buried in the sand. Those who visit the sea shores are familiar with the empty shells, which are quite common among the sea weeds and drift.



EGG OF THE SKATE (RAIA LAEVIS) SHOWING EMBRYO.

IMPROVEMENTS IN ELEVATORS.

The accompanying illustration represents various novel features of construction relative to elevator doors and means for operating them, a brake and safety devices, and other attachments, applicable to both freight and passenger elevators, and forming the subject of several patents in the United States and foreign countries, Mr. William N. Anderson, of San Rafael, Cal., being the inventor. The doors of the shaft openings are automatically opened and closed, so that there will be no draught in the well shaft, by the movement of the elevator car, which is raised by a cable attached to the top of the car frame and connected with a winding drum in the usual way. The car floor and top carries mechanism for operating the doors, which have on their under sides transverse strips aligning with the side posts, to form when the doors are open a continuous guide for the car. A cord affixed to the inner edge of each door extends over a suitable pulley, and carries at its outer end a weight or counterbalance, that the doors may be easily operated. Each door also has at one end a depending segmental rack meshing with one of two pinions depending in hangers from a floor joist across each entrance to the elevator well, the other pinion engaging toothed racks fixed to the top of the elevator car frame. The floor joist also has vertical slots in its inner side aligning with the racks on the top of the car frame, and with racks attached to the bottom of the frame, and engaging one of the sets of pinions, these slots being normally held closed by a spring-pressed plate, to prevent any draught through such opening, one of the doors also having an overlapping flange, that the elevator shaft may be at all times closed tightly, to prevent any upward draught of air.



ANDERSON'S IMPROVED ELEVATOR.

As the car ascends, the racks fixed to the top of its frame engage one of the pinions in hangers from the floor joist above, this pinion meshing with the other, and that with the segmental rack to raise the doors, which are closed, as the car continues upward, by the racks attached to the bottom of the frame engaging the pinions and actuating the segmental rack. The operation is reversed as the car descends, the doors being left closed in each case.

In the improved brake, which is designed to automatically stop the car when it exceeds a normal rate of speed, while being at all times under the full control of the operator, the brake shoes are arranged to engage the sides of the posts or guide ways of the elevator shaft. Each of the shoes consists of a block of rubber or other suitable elastic material, inclosed except on its face by a metallic casing, while the back of the casing is acted upon by eccentrics on a shaft on the under side of the carriage, a gear wheel on this shaft meshing with a segmental gear wheel on a weighted lever normally held by a catch in an inoperative position. A governor on the elevator carriage has a belt connection with a spring-pressed friction wheel traveling on one of the guide posts of the shaft, and the stem of the governor presses upon a pivoted lever connected with the catch holding the weighted lever adapted to operate the brake shoe, any too rapid descent of the elevator car causing the governor to release the catch and thus apply the brakes. A cord from the brake-operating lever also extends to the inside of the car, whereby the brakes may be readily operated by the occupant.

Among the other improvements provided for are the use of corrugated metal doors, the corrugations of one plate intersecting those of the other, the doors when open resting in recesses of the side posts, on one of which is a vertical rod having at its upper end a pivoted catch to engage and hold open the door, the catch being normally pressed by a spring on the rod, and the spring being secured to a latch projecting in the path of a block pressed outward from the cage by a spring. The doors are thus allowed to drop, in accordance with a different construction, in which pinions connected with the segmental gear are engaged by sliding racks secured to sliding bars moving vertically in a raceway secured to one of the side posts of the elevator well. The racks move simultaneously in opposite directions, serving either to open or close the doors according to the direction in which the cage is moving, and each rack-carrying bar having on its back side a projecting block with pins adapted to engage cam-shaped hooks pivoted in the raceway. The hooks are reversed for opposite bars, and are adapted to engage latches on the elevator cage, the latch being pivoted to the free end of bent arms and normally pressed forward by a spring. The latch carries on one side a roller adapted to engage rounded steps on the raceway, the pressure releasing the latches from the blocks so that the cage may move on without straining the mechanism, the steps being located on the raceway at a point opposite the blocks when the doors are in either a wide open or closed position. A gear wheel connected with one of the door racks has a loosely mounted drum within which is a ratchet wheel engaged by a spring-pressed pawl, the drum being encircled by a strap so that pressure can be brought on it to prevent the doors from slamming. A modified form of gearing is provided for use in cases where the elevator well is located against the wall of a building, the mechanism in each case being designed to work with a minimum of friction, while always keeping the elevator shaft closed against draughts.

Log Hauling Devices.

The inclined and horizontal log haul in operation at the Hudson River Pulp and Paper Company's mills, at Palmer's Falls, N. Y., consists of an endless detached chain, running in a recess at the bottom of a trough, having special links with log teeth every five feet and passing over sprocket wheels whose centers are 200 feet apart. The head wheel is 25 feet above the foot wheel. The water end of the chain swings, and can be raised or lowered by means of a small winch to suit the depth of the water. The logs are floated to the haul-up, and as they come around the foot wheel are caught on the teeth of the chain and carried up the incline at the rate of 125 feet a minute. On arriving at the top they are discharged into a horizontal log haul, having head and foot wheels nearly 600 feet apart, the whole being similarly constructed to the inclined haul. The return chain is supported by toothed idlers. A deflecting piece is placed across the horizontal conveyor, by which the logs elevated by the chain are thrown out of the trough and rolled over the side upon long skids.

The outfit has dispensed with the use of eight or ten double teams and as many men, and takes out logs as fast as they come down, preventing the accumulation that resulted under former methods. Some of the logs measure 30 inches in diameter and from 40 to 50 feet in length. The average is about three to the hundred feet. The power required is small, a 25 horse power engine being ample for the work at the pulp mill.

To polish deer horns, scrub them with a brush and sand to take off the dirt and loose fiber, then polish with rouge and rotten stone and a cloth, and varnish with copal varnish.