lessen the lifting power required to raise the ship. And now we have the pontoons, the chains, and the tackle all ready, and only await the change from the ebb to the flood tide to begin bringing the sunken steamship to the surface. As soon as low water slack occurs, the river water is let into the great pontoons till their decks are fairly a-wash in the surface of the river. The slack of the chains is quickly gathered in, the fall-and-tackle, which, as may be seen in the frontispiece, depend from the tops of the standards on the pontoons, are called into action, the hydraulic jacks are worked, and the chains hauled taut. As the flood tide serves and the waters gradually rise, the great steam pumps are set to work and the water is pumped out of the pontoons, and it is now a question whether the weight of the sunken ship—2,000 tons—which keeps her below is greater than the inclination of the great submerged pontoons or air chambers to force their way to the surface with their burden. If not, then the hulk will leave the bottom of the river, and the whole mass—pontoons, tenders, and the depending wreck—guided by powerful tugs, follow the flood tide up stream. Referring to the hydrographic chart, a shoal spot is discovered in the river bed, and pretty soon the sunken ship is directed toward and grounded upon it, and, at the next low water, the pontoons are again flooded.

Once more they sink to their upper surfaces, once more the slack of the chains which support the hull is gathered in, and the water again pumped out of the pontoons. At the next flood tide, the pontoons show more and more of their sides above the surface, and the hulk again forsakes the river's bottom and is towed to another and still another shoal spot, the pontoons being flooded at low water and pumped out at high water till finally her decks are above the surface. Then the steam pumps are set to work upon her, and she is freed from water. Now the great, ugly pontoons and wrecking schooners that so ill become her are cast off, and once more the gallant ship is free for a further career of utility.

The difficulties which beset the way of wreckers engaged in such an enterprise as raising a great ship like this from the bottom of the river are many and continuous, and sufficient to deter even the most skillful were they not led by so courageous and resourceful a master as Captain Merritt. Little or nothing could be done save during slack water, say two hours during the twenty-four at most, and often not so much as this, because the spring tides this year, owing to the unusual rainfall, were very heavy, and consequently the low water slack has been so short in duration as to be at times scarcely perceptible; the great rush of waters down stream toward the estuary formed by the junction of the two rivers often overpowering the incoming flood from seaward until well along toward the end of the first quarter. The ebb has claimed the mastery for more than its allotted six hours; the effect being the backing up of the waters of the bay against the yet running ebb of the river. In this swash the wreckers had to work while the pontoons rolled from side to side in the contention of the waters.

At times, toward the middle of the ebb tide, when the swollen waters of the upper river got fairly under way, the current rushed by the point where the wreckers were at work, at a speed of quite four knots an hour; and one day, while the struggle for mastery between the ebb and flood tide was in progress, and the waters of the bay were backing up against the river's ebb, so severe was the wrenching of the great chains against the steel keel of the sunken steamer, caused by the bobbing about of the pontoons holding the ends above water on either side, that one of these great chains was cut in two. The writer saw the parted link. It was fourteen inches long by two and a half in diameter, and was almost bent double, being cut through the center as if by a knife.

At times, before the heavy chains were fairly made fast around the hull of the wreck, the wrecking colony were almost torn from their moorings by tows coming down stream and stupid lightermen going up. On one of these occasions—it was on the early morning of March 27, before the cargo of tin had been taken out—two barges, the one loaded with brick, the other with plaster, drifted down upon them. The first scraped clear, while its mate ran foul of the protruding foremast of the sunken steamer, carried it away, and then went down, cargo and all, and settled itself athwart the fore hatch and foc'-s'le deck of the wreck. This had to be removed before the work could go on, because it was directly in the way of the sweep chains while passing under the bows of the sunken ship,

It is worthy of remark that the steamer Lone Star of the Morgan line, whose bow cut down the steamer Welles City, was destroyed by fire while lying at the cotton wharf on February 28.

The Photography of Projectiles.

A photographer at Pesth has succeeded in taking photographs of projectiles, fired from a Werendler gun, while having a velocity of 1,300 feet per second. The projectiles appeared on the impressions enveloped in a layer of air hyperbolic in form.

IMPROVED AUTOMATIC CUT OFF ENGINE.

The engine illustrated on the preceding page is manufactured by Messrs. McIntosh, Seymour & Co., of Auburn, N. Y. Great care has been taken that all the details should be in accordance with the best practice, and in design the engines are as compact and rigid, and as heavy in the stationary part, as could be desired. Those sections of the moving parts which usually show weakness have been made unusually heavy, although their gross weight has been carefully kept down. All the wearing surfaces are generous, and various devices for oiling them while the engine is running have been provided. Correctness, simplicity, and superiority of workmanship have been aimed at, while especial claim is laid to the efficiency of the balanced valve and the governor or automatic cut off regulator.

The valve is made very tight, has cast iron ends, and a tube connecting them. This is like the ordinary piston valve, and has been made in this form because it is very simple in form, is easy to make, and is perfectly balanced. In order to obviate the ordinary wear and tear from friction and the consequent loss of steam, an adjustable seat is provided, which consists simply of a crescent-shaped ring having steam ports through it which match with the ports in the steam chest itself. The ring is split, and is adjusted in place by a stem, which extends to the upper side of the steam chest, where it can be turned by a wrench. This construction enables the ring to be adjusted at any time a leak is discovered, and this may be accomplished quickly and easily. By using valves of large diameter and somewhat long travel, quick steam admission is secured and sharp cut-off.

The governor is located in the fly wheel, and consists mainly of a pair of weights pivoted at the periphery of the wheel and having inclined jaws, in which slide blocks, as shown in Fig. 3. These blocks turn freely in a pendulum, which is also pivoted near the periphery of the wheel (see right hand of governor in Fig. 2), and which is further connected with the eccentric and serves to either raise or lower the eccentric when it is subjected to a similar movement by the action of the sliding blocks in the jaws of the weights. As the speed of the engine increases, the weight will be lifted by centrifugal force against the action of the springs, and as they move outward the pendulum will be thrown over by the inclination of the jaws. This brings the center of the eccentric nearer the center of of the shaft and shortens the travel of the valve, thereby reducing the cut off and, consequently, the supply of steam supplied to the cylinder.

The extreme change of speed from when the engine is running light to when it is working under its maximum load is very slight. In some experiments made to test this point the variation in speed when the load was changed from 1·1 h. p. to 38·8 h. p. was only one half a revolution.

How to Catch and Preserve Moths and Butterflies.

There is no part of our country in which one cannot form a beautiful local collection, and any young person who wants amusement, instruction, and benefit from two, three, or more weeks in the country can find all in catching butterflies and moths, arranging them, and studying them up.

Provide yourself first with two tools, a net and a poison bottle. The net may be made of any light material. I find the thinnest Swiss muslin best. Get a piece of iron wire, not as heavy as telegraph wire, bend it in a circle of about ten inches diameter, with the ends projecting from the circle two or three inches; lash this net frame to the end of a light stick four or five feet long. Sew the net on the wire. The net must be a bag whose depth is not quite the length of your arm—so deep that when you hold the wire in one hand you can easily reach the bottom with the bottle (to be described) in the other hand. Never touch wing of moth or butterfly with your fingers. The colors are in the dusty down (as you call it), which comes off at a touch. Get a glass bottle or vial, with large, open mouth, and cork which you can easily put in and take out. The bottles in which druggists usually get quinine are the most convenient. It should not be so large that you cannot easily carry it in your pocket. Let the druggist put in the bottle a half ounce of cyanide of potassium; on this pour water to the depth of about three-fourths of an inch, and then sprinkle in and mix gently and evenly enough plaster of Paris to form a thick cream, which will *set* in a cake in the bottom of the vial. Let it stand open an hour to set and dry, then wipe out the inside of the vial above the cake and keep it corked. This is the regular entomological poison bottle, used everywhere. An insect put in it dies quietly at once. It will last several months.

These two tools, the net and the poison bottle, are your catching and killing instruments. You know where to look for butterflies. Moths are vastly more numerous, and while equally beautiful, present more varieties of beauty than butterflies. They can be found by daylight in all kinds of weather, in the grass fields, in brush, in dark woods, sometimes on flowers. Many spend the daytime spread out, others with close shut wings on the trunks of trees in dark woods. The night moths are more numerous and of great variety. They come around lamps, set out on verandas in the night, in great numbers. A European fashion is to spread on tree trunks a sirup made of brown sugar and rum, and visit them once in a while at night with net and lantern. Catch your moth in the net, take him out of it by cornering him with the open mouth of your poison bottle, so that you secure him unrubbed.

Now comes the work of stretching your moths. This is easy, but must be done carefully. Provide your own stretching boards. These can be made anywhere with hammer and nail and strips of wood. You want two flat strips of wood about seven-eighths or three-fourths of an inch thick and eight to fourteen inches long, nailed parallel to each other on another strip, so as to leave a narrow open space between the two parallel strips. Make two or three or more of these, with the slit or space between the strips of various widths, for large and small moths and butterflies. Make as many of them, with as various widths of slit, as your catches may demand. Take your moth by the feet, gently in your fingers, put a long pin down through his body, set the pin down in the slit of the stretching board so that the body of the moth will be at the top of the slit and the wings can be laid out flat on the boards on each side. Have ready narrow slips of white paper. Lay out one *upper* wing flat, raising it gently and carefully by using the point of a pin to draw it with, until the lower edge of this upper wing is nearly at a right angle with the body. Pin it there temporarily with one pin, carefully, while you draw up the *under* wing to a natural position, and pin that. Put a slip of paper over both wings, pinning one end above the upper and the other below the under wing, thus holding both wings flat on the stretching board. Take out the pins first put in the wings and let the paper do the holding. Treat the opposite wings in the same way. Put as many moths or butterflies on your stretching board as it will hold, and let them remain in a dry room for two, three, or more days, according to size of moths and dampness of climate. Put them in sunshine or near a stove to hasten drying. When dry, take off the slips of paper, lift the moth out by the pin through the body, and place him permanently in your collection.—*Wm. C. Prime, in N. Y. Jour. of Commerce.*

The Identification of Artificial Butter.

C. Fruwirth, of Vienna, Austria, in a letter to our cotemporary the *Country Gentleman*, states that the following proposition with regard to oleomargarine and artificial butters generally has been made in Germany. The indiscriminate coloring by some dye or pigment of all such articles had already been proposed and rejected. In consequence of this, Prof. Soxhlet, of Munich, has proposed a new treatment, which is worthy of attention. He proposes—and his proposition will be offered to the House of Representatives in Germany—to make it a law that all bogus butter must be mixed during the preparation with phenolphtalein, which is made out of one of the products of the dry distillation of tar, and one gramme of it will be enough for 100 kilogrammes of bogus butter. The butter can then be offered for sale colored yellow, or uncolored, or in any way desired, and the phenolphtalein will not be seen at all. But by adding a solution of soda, or ammonia and water (*liquor ammonii caustici*), or even a teaspoonful of water and the ash of a cigar, to a piece of butter the size of a bean, the wholeof the butter will become a nice red if it is bogus butter, or if bogus butter is mixed with it.

It will be immediately seen that this is a proof which can be made by every policeman in any shop, by every guest in a dining room, etc. In your country it would be easy to enact that no butter shall go out of the factories to which has not been added the phenolphtalein. The internal revenue officers, which have to deal, since the first of November, 1886, with bogus butter, could very easily took at this point also.

Rag Bleaching.

Dr. C. Wurster gives a description, in a recent number of the Berlin *Papier Zeitung*, of a process for resolving chlorine gas and collecting the gas for reuse. He connected the different bleaching vats with lead pipes with water valves and sucked out the gas with a ventilator. All the parts of this apparatus were coated with paraffine, which resists the action of the gas. Between the vats and the ventilator was placed a lead cylinder, full of coke, with water dropping upon it, to prevent volatilization. A false bottom with small siphons, whose upper edges are cut off obliquely, forms the distributing apparatus. The original plan of using lime water or a solution of soda for absorption of the chlorine was found unnecessary, as water alone answered the purpose. The use of this apparatus makes it possible for the men to step upon the vats in ten minutes and obviates the hurtful effect of the gas upon the workmen's health and the rusting of the machinery, because the air which flows from the ventilator scarcely even smells of chlorine.