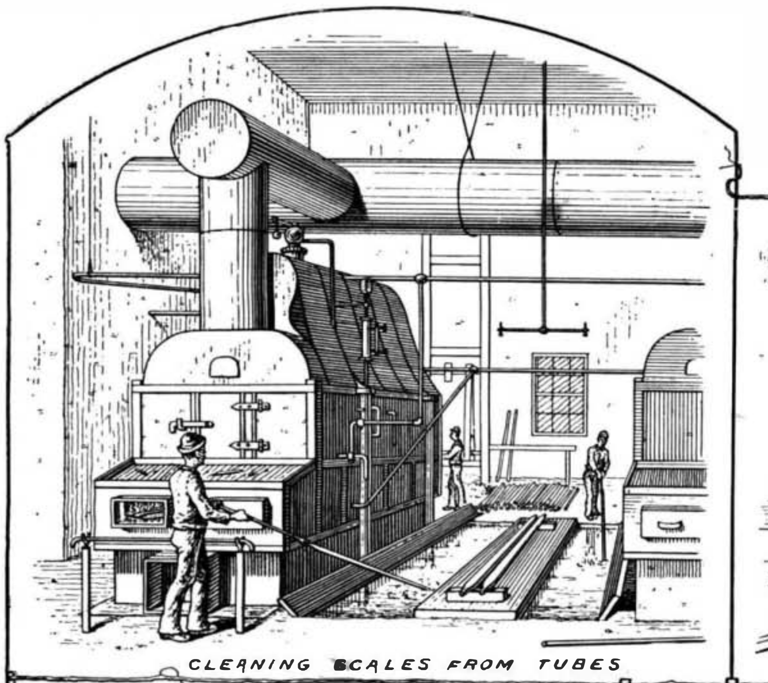
REDRAWING OF WROUGHT IRON TUBES.

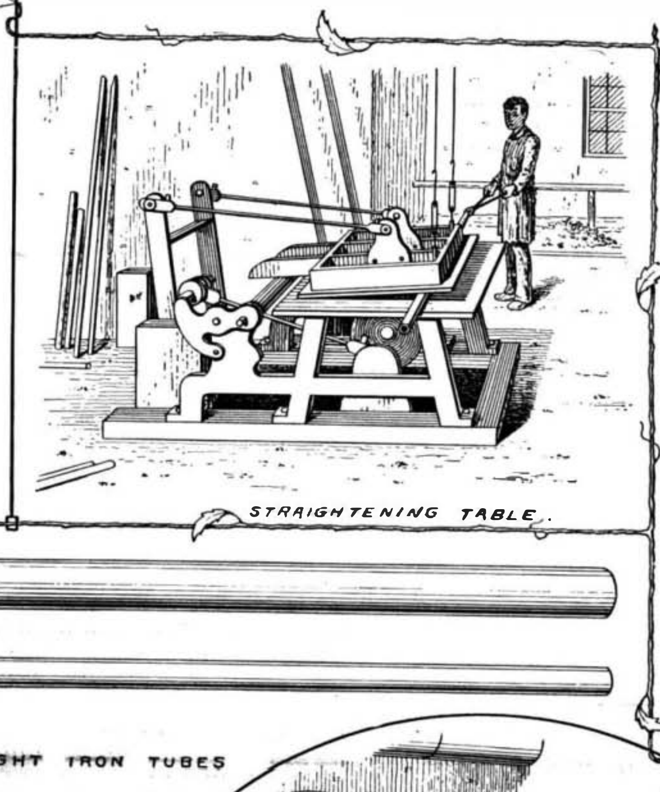
Redrawn wrought iron pipes or tubes are old stock that has been collected up, reheated and drawn through circular steel dies which press the tubes into the right diameter. This stock, which consists of old boiler tubing, railings, etc., is first heated red hot in a furnace. The furnace has two ovens or fire boxes each 15 feet in length, about 18 inches in width and about 8 inches in height and lined with fire brick. These fire boxes also heat the boiler, which is incased in the brickwork above. In one of the ovens a number of the old tubes are heated, the attendant, as soon as they become red hot, removing them by means of tongs and placing them in a dipping tank or reservoir containing cold water. This reservoir is about 18 inches in width and 24 inches in depth. As soon as the hot tubes come in contact with the water the dirt and scale instantly drop off, giving the pipe a brand new appearance. When cool they are shanked by heating one end of the tube red hot in a furnace, then hammering the heated end to a point on an anvil. The object of shanking is to have a good strong end for the jaws on the pulling carriage to catch hold of when the tube is drawn through the die. If the pipe was not shanked, the material would break off. After shanking the tubes are placed in the other fire box of the furnace and heated up to a white heat, about 1,500° F. Running from the mouth of the furnace is a draw bench about 21 feet in length and 10 inches in width. On this bench, traveling back and forth on a track, is a pulling carriage, connected to the front end of which are two movable steel jaws 8 inches in length and 1½ inches in width. At the head of the draw bench is an iron head block, against which the circular steel dies are held in position. Passing along the center of the draw bench and between the wheels of the carriage is an endless chain 45 feet in length. This chain is connected to the machinery and travels at the rate of about 80 feet per minute, running over a number of spiked 10 inch pulleys connected to the draw bench underneath. The dies are about 8 inches in diameter on the outside. The inside diameter where the pipe runs through ranges from 1 to 6 inches. The flanges on the dies are about 1 inch in thickness, the center or oval part being about 3 inches thick.

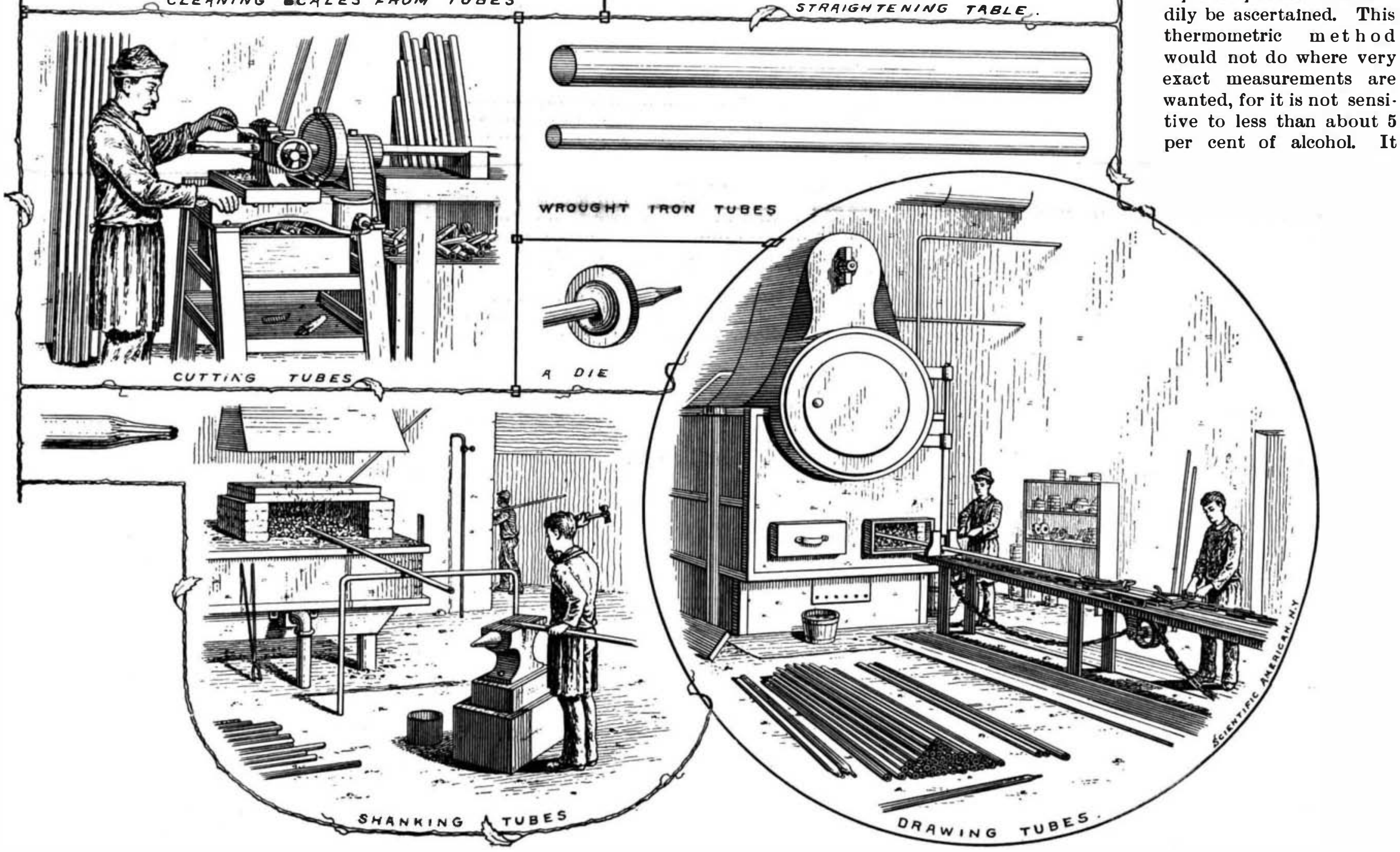
When the heated tube is ready, an attendant places the flat side of the die against the head block. The tube is then drawn out of the furnace with a pair of tongs and the flanged end cooled with water. The end is then run through the die into the jaws on the pulling carriage, which, when drawn taut, grips the end of the tube firmly. A movable hook attached to end of the carriage is then dropped down into a link of the chain and the apparatus set in motion. As the chain moves, the carriage is forced forward with it by means of the hook, drawing with it the red hot pipe through the die. The pipe, as soon as it is passed through the die, is reheated and drawn through another die a little less in diameter. This operation is repeated, using every time a smaller die until the right size tube has been obtained. About 1,500 feet of tubing is redrawn per day, it requiring the labor of three men. After the redrawing operation is finished the red hot tube is placed on the straightening table, over which slightly inclined is a movable flat iron frame which moves back and forth when the machine is in motion over the pipe. This frame, which is about 5 feet in length and 2½ feet in width, makes an 18 inch stroke. The weight of the frame, which is about 1,000 pounds, straightens the pipe in about one minute. After straightening, the tubes are carefully examined to see that there are no flaws in them. The parts to be cut off are marked by the examiner, who then passes them to the cutter. The pipe is placed in the machine and the knife or cutter put in position. The machine is then set in motion and the knife forced against the revolving pipe, which makes about from 25 to 40 revolutions per minute, according to the size of the tube, and is cut through in about two minutes. The knives are made of steel about 4 inches in length, about 1 inch in width and about ⅛ of an inch in thickness.

The machine will cut from 25 to 30 pipes per hour. During the cutting operation softsoap is applied, which keeps the knife from getting heated and also makes the material cut easier. The pipes when finished are used principally for boilers, green houses, hot water purposes, railings, paper rollers, etc.

The sketches were taken from the plant of the Eagle Tube Company, Jersey City, N. J.







THE TUBE REDRAWING INDUSTRY.

New Method for Determining the Percentage of Alcohol.

J. Barker-Smith (Jour. de Pharm. d'Anvers, li, 1895, p. 121) recommends a method depending on the well-known fact that alcohol and alcoholic liquids produce an elevation of temperature when mixed with water. He employs one drachm each of the liquid to be examined and of water, both at the same temperature, and mixes them quickly in a cylindrical receptacle; the latter should be provided with a cork and should not be touched by the fingers. The temperature of this mixture is now taken, and by referring to a table showing the temperatures obtained by mixing the same quantity of water with alcoholic liquids of known strength, the percentage of alcohol of the liquid in question can readily be ascertained. This thermometric method would not do where very exact measurements are wanted, for it is not sensitive to less than about 5 per cent of alcohol. It would, therefore, not answer for testing wines containing 10 per cent or less of alcohol. One point raised in its favor is that substances in solution do not interfere much with the test.

The above is a convenient and rapid process for determining the alcoholic strength of liquids containing a large percentage of alcohol, such as whiskies, brandies, tinctures, fluid extracts, menstrua, etc. —Merck's.

Good for Peary.

The past winter in Greenland was unusually mild, and the climatic conditions have favored Mr. Peary's expedition. The barks Silicon and Salina, the first of the fleet of cryolite traders to arrive at Philadelphia from Ivigtut, report that the Greenland coast has not been choked with ice as usual, while the brilliancy of the aurora made the long winter night almost like day.

Colored Fires.

Usually at this season of the year there are calls for colored fires; the following from Merck's Report, which it says are approved formulas, may be of interest. On account of the poisonous and explosive nature of some of the ingredients, the utmost care in their manipulation is necessary.

BLUE.

		Parts.
1.	Realgar	2
	Charcoal	3
	Potassium chlorate	5
	Sulphur	13
	Calcium nitrate	77

or :

		Parts.
2	Orpiment	1
	Charcoal	1
	Black antimony sulphide	16
	Potassium nitrate	48
	Sulphur	64

The objection to almost all blue fires is that when burned they generate arsenical fumes, and are, therefore, not suitable for indoor use. A blue which can be used in a theater or large hall, though less brilliant than the foregoing, may be made as follows :

		Parts.
3.	Sulphur	15
	Potassium sulphate	15
	Ammon. copper sulphate	15
	Potassium nitrate	27
	Potassium chlorate	28

CRIMSON.

		Parts.
4.	Potassium chlorate	17
	Charcoal	23
	Sulphur	90
	Strontium nitrate	270

or :

		Parts.
5.	Charcoal	18
	Antimony sulphide	22
	Potassium chlorate	69
	Sulphur	72
	Strontium nitrate	220

GREEN.

		Parts.
6.	Potassium chlorate	13
	Barium nitrate	66
	Sulphur	21

or :

		Parts.
7	Metallic arsenic	2
	Charcoal	3
	Potassium chlorate	5
	Sulphur	13
	Barium nitrate	77

or :

		Parts.
8.	Charcoal	2
	Black antimony sulphide	2
	Potassium chlorate	5
	Sulphur	6
	Barium nitrate	80

LILAC.

		Parts.
9.	Black copper oxide	6
	Chalk (dry)	20
	Sulphur	25
	Potassium chlorate	49

PINK.

		Parts.
10.	Charcoal	1
	Chalk	20
	Sulphur	20
	Potassium chlorate	27
	Potassium nitrate	32

or :

		Parts.
11.	Sulphur	16
	Calcium chloride, dried	23
	Potassium chloride	61

PURPLE.

		Parts.
12.	Lampblack	1
	Realgar	1
	Potassium nitrate	1
	Sulphur	2
	Potassium chlorate	5
	Strontium nitrate, fused	16

or :

		Parts.
13.	Copper sulphate	39
	Sulphur	52
	Potassium chlorate	310

RED.

		Parts.
14.	Charcoal	1
	Black antimony sulphide	4
	Potassium chlorate	5
	Sulphur	13
	Strontium nitrate, dried	40

or :

		Parts.
15.	Sulphur	16
	Strontium carbonate	23
	Potassium chlorate	61

or :

		Parts.
16.	Antimony sulphide	4
	Potassium chlorate	5
	Sulphur	13
	Strontium nitrate, fused	40

A little charcoal or lampblack makes it burn quicker.

VIOLET.

		Parts.
17.	Charcoal	8
	Sulphur	10
	Metallic copper	15
	Potassium chlorate	30

or :

		Parts.
18.	Alum	3
	Potassium carbonate	3
	Sulphur	4
	Potassium chlorate	15

WHITE.

		Parts.
19.	Potassium nitrate	30
	Sulphur	10
	Black antimony sulphide	5
	Meal powder	3
	Powdered camphor	2

or :

		Parts.
20.	White arsenic	1
	Charcoal	2
	Black antimony	16
	Potassium nitrate	48
	Sulphur	64

YELLOW.

		Parts.
21.	Potassium nitrate	2
	Sulphur	4
	Sodium nitrate	20
	Lampblack	1

or :

		Parts.
22.	Sodium nitrate	3
	Potassium chlorate	1
	Shellac	1

In the preparation of colored fires the ingredients, which should be perfectly dry, must be separately powdered and sifted through a hair sieve, and put into well stoppered, wide mouthed bottles until ready for mixing. The mortar must be thoroughly cleaned, before and after powdering each ingredient, particularly potassium chlorate. Mix with the hands or with a wooden spatula on sheets of white paper.

Sulphur, and salts of the poisonous metals—antimony, arsenic, mercury, etc.—should not be used in making colored fires for indoor use. The sulphur may advantageously be replaced by shellac, which hardly smokes at all when ignited.

For red the following formulas are used :

		Parts.
23.	Potassium chlorate	1
	Shellac	1
	Strontium nitrate	3

or :

		Parts.
24.	Strontium nitrate	12
	Potassium chlorate	8
	Milk sugar	1
	Stearin	2

For green the following is employed :

		Parts.
25.	Potassium chlorate	2
	Barium nitrate	1
	Milk sugar	1

High Speed of Electric Motors.

Some interesting trials on the Nantasket branch of the New York, New Haven & Hartford Railroad occurred June 20 and June 22. The Nantasket Beach branch was chosen for the experiment for the reason that within its limits will be included most of the different problems which will have to be determined to make electricity a successful substitute for steam. The curves are many and sharp, the grades are steep and trains will be run with great frequency. Seven miles is the distance between the Old Colony station and Pemberton. The tracks are fifteen feet apart from center to center, and between the tracks is a single line of poles on which are supported the cables and trolley wire. Upon the tangents the poles are set with such geometrical precision as to secure absolutely perfect alignment. The two flexible copper bonds seven inches long are under the base of the rail at each joint and riveted to each rail. A power house, No. 1, is situated midway between the terminals and contains two tandem compound engines; the two generators develop fifteen hundred horse power each. Four motor cars have been built after the style of baggage cars. To secure traction they have been made extra heavy, so that when fully equipped they will weigh about 60,000 pounds each. Two will have four motors each and the other two motors each hung on trucks. The cars are equipped with the Westinghouse air brake, and in addition to a 15 inch gong, there will be a chime whistle worked by compressed air. The test was held in the presence of only a few invited guests. There was none of the gradual increase of speed characteristic of the steam locomotive. A test was made of a load of 175 tons, equal to a train of seven cars, but the ease of starting and the speed obtained showed that a load of three or four times as great could be easily drawn. A speed of more than 50 miles an hour was obtained, and for a part of the distance it was estimated that the train made at times the enormous speed of 80 miles per hour. A hot box prevented a greater increase of speed. When the train was making 80 miles an hour there were still five notches left in the "controller" in the motor, so if the additional current had been applied, it is thought that a speed of 90 miles an hour might have been obtained on the level stretches.

The New Atlantic Steamer St. Louis.

The St. Louis finished her second voyage at New York on June 22, 1895, completing the passage from Southampton in seven days, seven hours and eleven minutes. The outward passage was made in seven days, three hours and fifty-three minutes. When three days out from Southampton, while proceeding in the face of a heavy wind, the ship would not respond to her rudder. An inspection was quickly made of the machinery, which was found to be working perfectly. The hand steering apparatus had been used, and that was tested, but the St. Louis would not respond; a sailor was sent over the stern to see what was the trouble. He discovered at a glance that the bracing plates of the twenty-seven ton rudder had broken and that the fracture extended diagonally upward from the pintle of the rudder; there was therefore no leverage for the steering gear and the ship was practically helpless as far as her rudder was concerned. The captain and chief engineer decided that the twin screws should be used to guide the vessel, so they shifted the action of the port and starboard engine as the course demanded and the St. Louis forged ahead with little diminished speed. The accident was due to a hidden flaw in the steel of which the rudder was made. The rudder was taken off when she reached her dock and that of her sister ship, the St. Paul, was substituted, the work being quickly done, and the St. Louis sailed on her third voyage on her schedule time, June 26.

The Strangest Insect in the World.

The aweto, as the Maoris or natives of New Zealand call it, or Hipialis virescens, as naturalists term it, is found in New Zealand, and is a vegetable caterpillar of from three to four inches in length, and, so far, science has not been able to say whether it is a vegetable or an insect. It is always found at the foot of large myrtle trees that have beautiful red flowers on their stems, and a beautiful creeping clematis as white as the snow. The Maoris call this tree by the name of rata. The aweto buries itself among the roots of the rata, a few inches below the ground, and there lives until it is full grown, when it undergoes a most wonderful change. The spore of a vegetable fungus, termed by naturalists Sophœria robertsii, fastens itself to the neck of the caterpillar, just between the head and the first ring, and then grows upward to the height of from six to eight inches. Many people assert that there is never more than one stem, but such is not the case, for some have been found with two stems, although very rarely. The stem shoots up out of the ground, above where the caterpillar is living, about two or three inches; below the earth it grows into the aweto, until it fills up every possible space within the outer skin without changing the form of the insect in the slightest way whatsoever, but simply substituting a vegetable matter for animal matter. As soon as this takes place both the plant and the caterpillar become dry and hard and die, but retain exactly the same form as when alive. The whole has a brown color, and the insect appears a wooden caterpillar, with a huge horn standing up from the back of its neck. How the caterpillar manages to propagate its species no one can tell. Usually the caterpillar becomes a chrysalis, the chrysalis changes into a moth, the moth lays eggs, and these eggs again become caterpillars, and so on without stopping. Many reasons are given why the plant shoots up from the back of the neck of the aweto. One is that the aweto has a slimy substance oozing from its neck, which, while the aweto is boring at the foot of the rata tree for its only food, catches the seed of the fungus and holds it fast there till the latter begins to grow. When it has sucked all the vegetable life out of the aweto it must naturally die, for it finds no further nourishment. The aweto is often found in large numbers.—Public Opinion.

Relative Strength of Metal and Timber.

Doctor Robert H. Thurston, in a recent article, discusses various materials in which comparisons of interest are made. At the outset he gives the following generally accepted figures: Cast iron weighs 444 pounds to the cubic foot and a 1 inch square bar will sustain a weight of 16,500 pounds; bronze, weight 525 pounds, tenacity 36,000; wrought iron, weight 480, tenacity 50,000; hard "struck" steel, weight 490, tenacity 78,000; aluminum, weight 168, tenacity 26,000. We are accustomed to think of metals being stronger than wood, and so they are, generally speaking, if only pieces of the same size be tested. But let equal weights of the two materials be compared, and it will then be found that several varieties of wood will prove stouter than ordinary steel. A bar of pine just as heavy as a bar of steel an inch square will hold up 125,000 pounds, the best ash 175,000 and some hemlock 200,000 pounds. Wood is bulky. It occupies 10 or 12 times the space of steel.