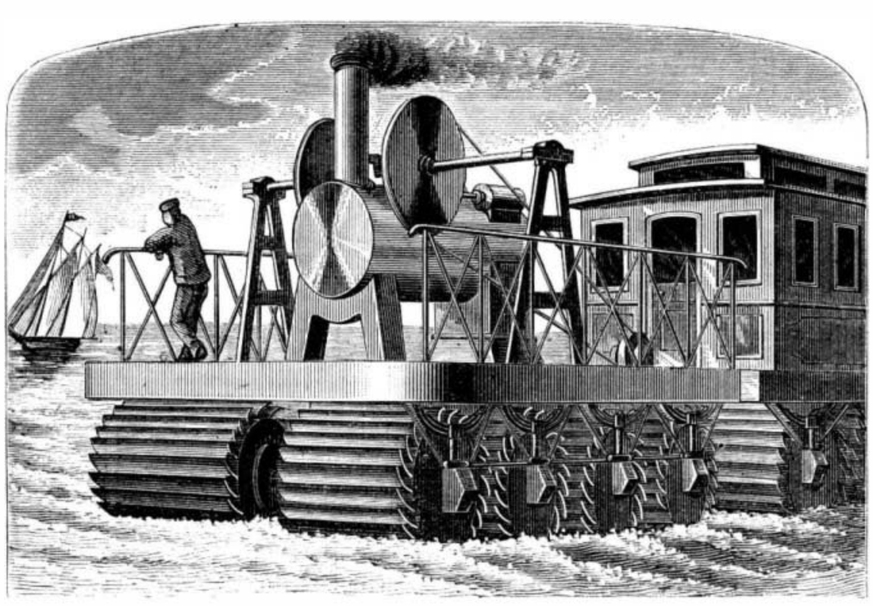
A NOVEL MODE OF MARINE PROPULSION.

M. A. Huet, a Dutch civil engineer, has invented a marine carriage; or, in other words, he proposes to propel a locomotive, with its train of cars, over the surface of a canal or river at as great a speed as upon a railway on land. How this result is to be accomplished our engraving illustrates. The locomotive and cars are separate vehicles, and each rests on a number of cylinders placed as represented, and arranged to revolve freely on axles. Each cylinder is a paddle wheel, the buckets of which are placed parallel to its axis, and are bent upwards so that the lower portion of the curve strikes the water nearly parallel to its surface, thus tending to lift the superstructure upwards as well as propel it forwards. The inventor suggests that some of the paddle wheels may be constructed with floats arranged spirally: those on one side of the car being inclined in one direction, and those on the opposite side in the other, so that the water may be thrown obliquely outwards to the rear.

The motive power is supplied by a small double cylinder engine placed horizontally upon the boiler upon the platform of the locomotive. The machine is of the simplest form. The piston rod actuates a shaft on which are driving pulleys, from which, by means of a belt, motion is communicated to the two rear paddle wheels. These are connected by an endless belt with pulleys situated on the inner ends of the other cylinders which are thus rotated. Steering is accomplished by going ahead with the paddle wheels on one side, and, if necessary, reversing the others, according to the direction to be taken up. A number of rudders may also be arranged, one in front of the locomotive and the others in rear of the cars. The platforms of the vehicles have rounded ends to admit of their turning curves, and springs are provided above all the axles to lessen the vibration caused by the paddles striking the water.

The inventor states that the machine can be quickly stopped by arresting the motion of the engine. The train, which when moving is slightly lifted up by the downward action of the paddles, then increases its draft of water, becoming more submerged, and so opposes a larger surface of resistance to the fluid. Consequently its momentum is quickly overcome. For sudden stoppage, broad boards are to be dropped at right angles to the line of advance, and the same are also to be used at either side of the vehicles when they are running with the wind abeam, in order to prevent lee way.

The plan, we think, would be plainly impracticable in a sea way, while the probability of the cars remaining upright, even in smooth water, during a strong wind seems to us very slight. The practical feasibility of the idea remains yet to be demonstrated.

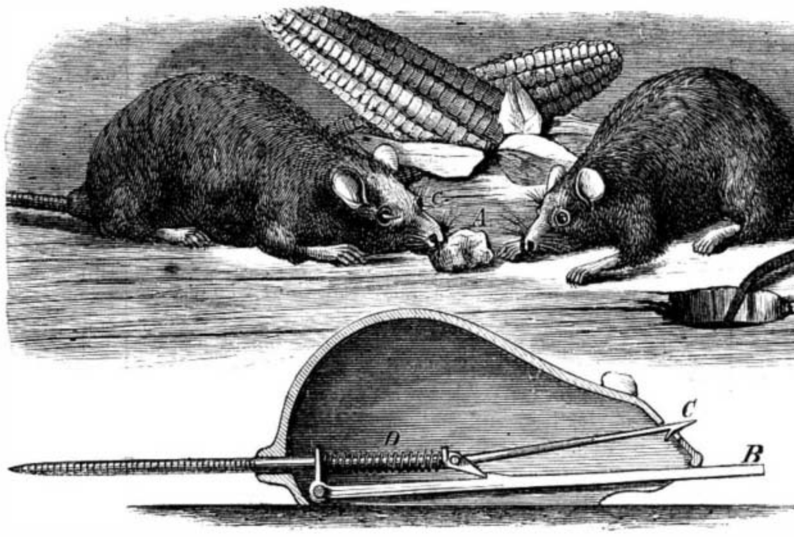


A NOVEL MARINE PROPELLER.

NOVEL RAT TRAP.

The Spanish Inquisition, among its other diabolical implements of torture, had a life sized figure, sumptuously dressed to represent some female saint. After a victim had been put through the usual course of rack, hot pincers, etc., he was requested to kiss the image. The moment, however, he began his osculatory performance, the dummy extended its arms, enfolded him in an embrace which was lined with dagger points, and then, a convenient trap door opening, dropped him into unfathomable depths below.

This rat trap is something on the same principle, only the rodent is drawn to his doom through his unquenchable appetite for cheese. A dummy rat is constructed of any material to closely imitate the real animal. From his nose extends the rod, B, to which the bait, A, is affixed. D is another rod surrounded by a coiled spring, one end of which catches in a projection in the rod, B, and the other emerges *à posteriori*, and serves for a tail. C is one of two long needles barbed at the ends, fastened to the rod, D, and protruding from the eyes of the imitation animal. The genuine rat, smelling the bait, perceives it under the nose of a rival. He immediately prepares to capture it, collects his energies, makes a rush, and springs the trap. The keen points shoot forth from the eyes of the artificial monster, bury themselves in his body, and the barbed ends hold him fast. Then he remains and absorbs the cheese at his leisure. J. W. Ellis, patentee, of Pittsburgh, Pa.



A NOVEL RAT TRAP.

The Spontaneous Ignition of Oiled Cotton or Silk Waste.

Major Majendie has communicated to the Royal Artillery Institution the results of certain experiments, instituted to ascertain the relative degree of risk accompanying the presence of oiled cotton waste and oiled silk waste in buildings and stores.

Mr. Galletly, who made the investigation referred to, read a paper at the Brighton meeting of the British Association for the Advancement of Science in August last, on a series of experiments carried on by him, with a view of determining precisely the conditions under which spontaneous combustion takes place in cotton and other combustible material, when impregnated with animal or vegetable fatty oils. Mr. Galletly found that cotton waste soaked in boiled linseed oil and wrung out, if exposed to a temperature of 170°, set up oxidation so rapidly as to cause actual combustion in 105 minutes in the case where the action is slowest. The quantity in this instance was sufficient to fill a box 17 inches long by 17 inches broad, and 7 inches deep, but unfortunately it is by no means necessary that the waste should exist in any such bulk, a common lucifer match box full igniting in an hour in a chamber at 166° Fah.

Raw linseed oil ignited less readily. The experiment was made in a smaller case than the first one above mentioned. Active combustion took place in four or five hours. Rape oil and Gallipoli olive oil ignited somewhat less readily, taking at least five hours, though generally a good deal more. Rape oil, in fact, took over six hours at 170°. The temperature of 130° was employed in the case of the Gallipoli oil, and also in the following instances: Castor oil took over a day before ignition; lard oil took four hours; salad oil, one hour and forty minutes; and sperm oil refused to char the waste at all.

Mr. Galletly considers that the heavy oils from coal and shale tend remarkably to prevent the oxidation described, by protecting the tissue from contact with the air. It appears that the so-called spontaneous action of oiled cotton waste proceeds from the substance being exposed in a finely divided condition to the oxidizing action of the air. In point of fact it is the same action that causes the bloom in some of the direct processes for the reduction of iron to revert to the oxide when exposed in a heated state to the air, and the still more remarkable action that is said to have taken place in the iron removed from the Mary Rose, which had lain at the bottom of the sea till it became eaten into a porous condition. It appears to have been hoped that silk waste might have offered greater security, but this proves not to be the case: a little powder in the center of silk waste igniting in an hour, while under the same conditions powder enveloped in cotton only fired in an hour and a half. The silk of course did not itself fire like the cotton, but this would be a matter of little moment, unless the quantity of powder in its immediate locality was very small indeed. It is important to note results which may be of such importance to shops, and other factories than those for powder. It is to be regretted that nothing more encouraging can be drawn from them than the caution not to leave oiled waste about, even in the smallest quantities, especially in warm places.

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THE ONEIDA COMMUNITY has, according to the *Circular*, been recently exercised by the posting upon its bulletin of the following conundrum: "Why does a spinning top, at the close of its whirl, apparently go into a motion in the opposite direction from that in which it started?" This inquiry set all tongues in motion, men, women, and children, and the discussion is doubtless still in progress.

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THE new railway from Joppa to Jerusalem conveys passengers through in two hours. The romance of traveling in the Holy Laud is forever gone.

How to make Good Butter.

Philadelphia butter is a luxury which probably a very large number of our readers know only by name, and which, like the Devonshire cream of England, is believed unattainable save in the immediate neighborhood of the place of its production. Although this idea is doubtless correct regarding the latter delicacy, still it is not true of the far famed "gilt edged" butter of our sister city; at least so says a a correspondent of the *Practical Farmer*, from whose letter we extract the following hints, by observing which, we are assured, the genuine article may be made:

Premising that good cows—Jerseys are the best—and excellent feeding and management are secured, the following essential points must be noted. Stable, milking sheds, and spring house must be clean, well ventilated and free from all noxious odors. The milk must be skimmed soon enough after milking to obviate all danger of moldiness or absorption of the results of fermentation. This must depend largely upon the experience, judgment, and observation of the person in charge, though perhaps the best rule is to skim at the precise earliest moment when all the cream can be procured from the milk. Keep the vessel containing the cream down to a low temperature, stirring it daily with a long handled wood spoon. This low temperature for the cream, so as to avoid all dangers of fermentation, is very important. Avoid what is called washing the butter, as the fine flavor is thus carried off. Churn the cream at such a low temperature that, at the point of turning into butter, it will come hard; and this is entirely within the control of the dairyman, by throwing in either lumps of ice or pounded ice at the critical moment, and giving the churn a few more turns, so as to lower the temperature of the mass, and allow the butter to be taken out hard. If this is not done, and the mass of butter is soft or oily, it cannot be properly worked and will never make a good article. Two workings are required, one on taking out of the churn, to get rid of most of the buttermilk, when it is salted and laid away for two or three hours. The final working is then done on the butter table, ten or twelve pounds at a time, or on the butter worker. A fine muslin cloth is wrapped around a fine sponge, with which the flattened out surface of each lump is patted till everything like buttermilk or water is absorbed. The sponge and cloth are, of course, from time to time, wrung out as needed. The sponge is a powerful and thorough absorber—nothing equals it in this respect. The salting is at the rate of two thirds of an ounce to each pound. Butter may be worked too much, and it may be worked too little. It must be solidly and neatly printed, have a fine white muslin wrapper around each pound or half pound, and be delivered in market as solid as when it left the spring.

An Air Well.

A correspondent, G. W. G., asks the opinion of the scientific world on the following:

A tube well was driven to the depth of 53 feet for water, but instead of obtaining the object, a strong current of air came rushing out of the tube with such force that the noise could be heard at a distance of several rods. Fire at the bottom of the tube burned brightly, and the air came out with a steady flow. This continued for about five days, when the current changed, and air flowed into the tube at about the same velocity. The location is on a divide—the highest point of land between Toledo and Chicago; the country is generally level, but somewhat rolling. Professor Foster, of Chicago, has been written to for his opinion; he thought the current of air might have connection with a subterranean cave, and thence rose to the surface; but the reversal of the current, without any change of temperature above, exploded that theory. If it was in the vicinity of coal, instead of pure air, gas would naturally escape. The soil is sand and gravel, with blue clay beneath. The tube was with withdrawn and sunk in another place to the depth of 70 feet, when rock was struck, but no water was found.

The "Scientific American" Cubically Considered.

C. J. F. writes to say that he has collected his numbers of our journal, from its birth, from his shelves, and finds that the pile measures forty-three inches in hight. He could not but be gratified to think how considerable was the knowledge he had acquired by reading such a mass of information, obtained at so small a cost.

Treating Hardened Leather.

A. J. B., a practical man, says: "Mineral and vegetable oils are of no use on leather, and fish oils destroy leather when used pure. One part fish oil to three parts neats' foot is good for common half finished leather: but for highly finished leather, pure neats' foot is best. The white or yellow neats' foot oil is the proper sort; the reddish is adulterated. Sheep's foot oil, nearly white, is better still. If leather valves, etc., are made of half cured hides, they become converted into horn, and will stay in that condition. To soften hardened leather: Wash in lukewarm water with a little soap, use a wooden-backed brush with short bristles, as used for washing horses; scrape off the dirt and outer skin with a blunt knife. Keep on this treatment till the hide is half saturated; then twist, turn and roll the leather with both hands till all the pores are open, and work them well; if you see small cracks on the surface, good; if the leather splits, it is rotten. While the leather is damp, begin to rub in the oil with a brush as before described; use a little oil at a time and apply four or five times, and work the leather well with the hands after oiling. Set it in a hot sun for half an hour, and then put in a damp place with a wet sack over it. To keep off rats, invert a wooden box over the heap. Oil and work again the next day, and for many days after; and then compare with an old pump valve, and observe the difference."

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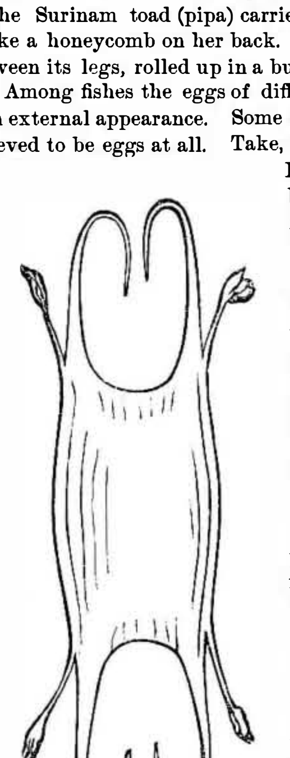
THE WONDERS OF THE EGG.

Professor Agassiz recently delivered a most interesting lecture at the Museum of Comparative Zöology, Harvard University. It was profusely illustrated by specimens from the shelves of the museum. We take the following report from the New York *Tribune*:

The Professor said: The formation and growth of the egg and its fecundation prior to the formation of the new being are among the most mysterious processes of the organic world. The eggs laid by different kinds of animals are themselves so various in size, form and appearance that it is difficult to believe they are all one and the same thing. Look at this huge egg, for which a man's hat would be too small a cup. It is the egg of an extinct bird found at Madagascar (the epiornis), the largest bird's egg known. Compare it with the egg of the humming bird, smaller than a hazel nut, scarcely larger than a small pea. In form and general aspect the difference, even among birds' eggs, is endless. Some are elongated, some are spherical, some are dull on the surface, some are polished, some are dark, others gray or white, others very bright. The number known is large. Ornithologists are acquainted with about 5,000 different kinds of birds' eggs While they differ in detail, the general pattern of birds' eggs seems the same. The outside shell is brittle, and within there is a lining membrane covering the white, while in the center is the yolk, differing in dimensions in different species of birds as much as the eggs themselves. Quite otherwise, seemingly, is the egg of the mammalia. Those which are developed are never laid. As eggs they are microscopically small, and they undergo all their transformations within the mother. Yet their structure at some time or other, in an early stage of their growth, is the same as that of the egg in all other classes of animals.

Among reptiles the eggs exhibit great variety. The eggs of alligators are elongated, almost cylindrical, evenly rounded at both ends, and about the size of an ordinary duck's egg. The eggs of the sea turtle are about as large as a small apple, rounded, and have a flexible shell. Those of the snapping turtle are much smaller, but also rounded. Those of our terrapins are oblong, as are also those of lizards. Snakes' eggs are oblong and sometimes cylindrical in shape. Frogs and toads lay numbers of small eggs. They are dropped in the water like fish spawn, in large clusters or strings. The Surinam toad (pipa) carries her eggs soldered together like a honeycomb on her back. The alytus carries them between its legs, rolled up in a bunch.

Among fishes the eggs of different kinds differ amazingly in external appearance. Some of them would hardly be believed to be eggs at all. Take, for instance, the skate's egg. It looks like a flattened blackish leather bag, with four horns or handles at the four corners. The yolk in such an egg is the size of a walnut, or larger or smaller according to the species. All skates and sharks have eggs like these, though not all lay them, the young in many instances undergoing their development within the mother. The chimera has a still more curious egg. It is like a leaf made out of parchment. In the center is an oblong cavity containing the yolk.

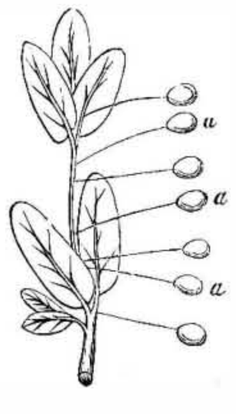


THE SKATE'S EGG.

The number of eggs laid by animals belonging to the same class is again singularly different. The eggs (or, as we call them, the spawn) of some fish are exceedingly small and are laid in large masses. The spawn of a single herring is made up of hundreds of thousands of eggs. Other fishes lay only a few dozen at a time, and in some kinds they are of considerable size. Some fishes let their spawn fall into the water; others make nests for their eggs, and others carry them until the young are fully developed. Some catfish carry their young in the mouth till they can provide for themselves. Certain fishes carry their young along the gills and they go in and out at will through the gill cavity. Some carry them attached to the surface of the belly or under the tail, and among the pipe fishes, strange to say, this office devolves upon the males (syngnathus).

In the higher vertebrates the young are less numerous. A great many mammalia bear but one at a time.

Insect eggs are, as a general thing, too small to be perceptible at a distance. The egg of a day butterfly is attached by a string to a twig. Those of certain water insects are kept floating by string-like appendages. The eggs of the pearl wing fly are fastened by the frailest possible threads to the margins of leaves [*a*, *a*, *a*, in diagram]. Those of the seventeen year locust lie side by side in rows in the branches of trees. Those of the so-called soothsayer (mantis) are deposited in large, elongated clusters which might be mistaken for a caterpillar at rest.

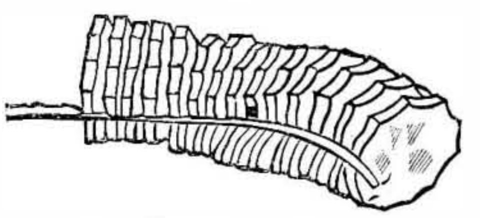


THE EGGS OF THE PEARL WING FLY (CHRYSOPA).

In the two other classes of articulates, in the crustacea, (crabs, lobsters, shrimps, and the like), and in worms, the eggs vary less than in insects. In the crustacea they are always small, and are carried under the tail.

In the type of mollusks we find great variety among the eggs. There are mollusk eggs which might easily be mistaken for birds' eggs, some of which are larger than most birds' eggs. At first sight one would be quite sure that the egg of a bulimus was a humming bird's egg. Others again are very different from the eggs of any animal belonging to other types.

Here, for instance, is the long string of



EGG CASES LAID BY THE PYRULA,

every such case containing from 15 to 20 eggs, and sometimes more. Others lay clusters of eggs surrounded by an egg case. The periwinkle lays an immense mass of eggs, larger than the shell itself. Here are what are called sand saucers formed by the eggs laid by the natica. The mass of eggs is pressed out between the shell and the soft parts of the animal, which at the moment are so expanded and protruded as to cover the whole surface of the shell. The mass of eggs thus laid is molded as it were to the external form of the shell; and being laid while the animal is buried in the sand, the sand accumulates upon them and forms the disk like shape. If you cut such a so-called sand saucer across, you will find minute eggs the size of a pin's head laid side by side throughout it, every egg containing, perhaps, from six to seven individuals.

Among bivalves there is not so great a diversity of eggs as among univalves. They are usually small, like spawn, and generally retained by the mother.

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THE CONFIGURATION AND DIMENSIONS OF BLAST FURNACES.

We extract the following description and illustrations from Stölzel's work on metallurgy:

In building a blast furnace, it is usual to make the exterior either in the form of a quadrilateral pyramid, or a truncated cone; sometimes, however, a conical superstructure is placed upon a pyramidal base. The shell, in many furnaces, rests on four corner pillars, the tops of which are connected by arches, or the pillars are surmounted by iron girders set in form of stairs. In other cases, the shell is supported by a ring wall and boshes, with a cast iron crest resting on pillars. In this latter arrangement, commonly used in Scotland, the hearth is free and accessible in all parts. Sometimes the construction is varied by setting only the ring wall and boshes on pillars, the outer shell resting on a solid wall. In the truncated conical furnaces it is often customary, especially in England, to use a sheet iron mantle instead of one of masonry; the mantle then consists of rings or riveted iron plates, and is lined with stone.

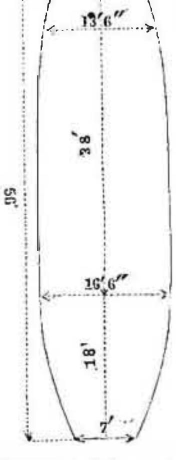

Fig. 1. Capacity 9,300 cubic feet, Schneider, Hannay & Co., Barrow-in-Furness, Lancashire.

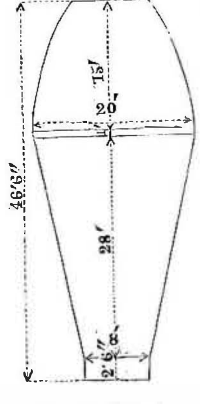

Fig. 2. Capacity 8,000 cubic feet. Ebbw Vale, Wales.

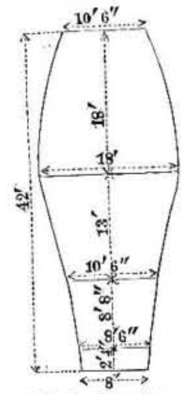

Fig. 3. Capacity 6,160 cubic feet. Dowlais, Wales.

But the variations in the form of the interior of the blast furnaces are still more important. The differences which exist in this may be seen in Figs. 1 to 12, in which the sections of various blast furnaces are represented.

Either these changes are made to suit the different processes and the diverse natures of the raw materials, or else the different forms have been brought about by the absence of any well known rules. In some instances the latter deficiency is easily seen; and so various are the forms employed, that we cannot attach much importance to uniformity in these structures.

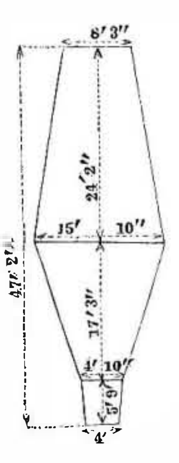

Fig. 4. Capacity 4,540 cubic feet. Nithsdale, Scotland.

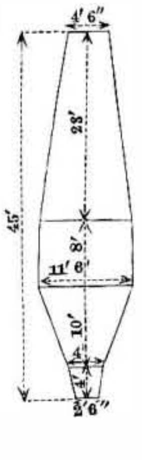

Fig. 5. Capacity 2,600 cubic feet. Madeley Wood, Shropshire, Eng.

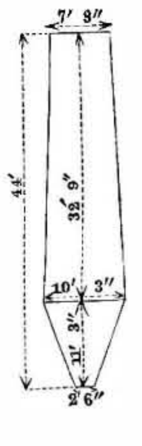

Fig. 6. Capacity 2,300 cubic feet. Low Moor, Yorkshire, England.

The hight of the shaft is, in charcoal furnaces, from thirty to forty feet, and in stone coal and coke furnaces, from forty to fifty feet, rarely more or less. Higher shafts are especially suitable for fuel (with the exception of anthracite) requiring a strong blast, for uncalcined and refractory ores and for unburned limestone; this is owing to the fact that the heat is better utilized in a tall furnace. Yet there is a certain limit to the hight, because (1) the materials forming the lower courses would be weakened by the superincumbent weight, and (2) on account of the resistance which a high column offers to the passage of blast and gases, a sort of back pressure. Hence, in order to increase the capacity of a furnace, it is preferable to increase the width rather than the hight. The diameter of the furnace at its belly, or widest part, is from one fifth to one third of the entire hight of the stack; in charcoal furnaces it is from five to eight feet, in coke furnaces, from ten to sixteen feet, or even more; and the belly is set higher or deeper in the length of the shaft according to the time which the materials require to be subjected to heat before smelting, and according to the pressure of the blast. In recent times, the belly or largest part has often been constructed in a cylindrical form, or in a slightly bent curve.

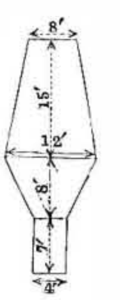

Fig. 7. Capacity 3,440 cubic feet. Muirkirk, Scotland.

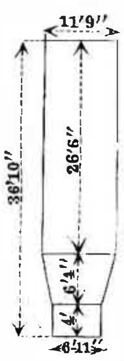

Fig. 8. Capacity 4,211 cubic feet. Königshütte, Upper Silesia.

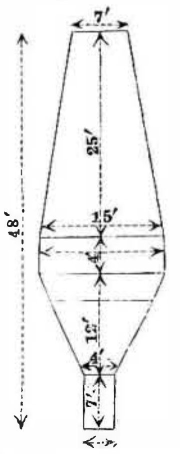

Fig. 9. Capacity 1,720 cubic feet. Watney's anthracite furnace, South Wales.

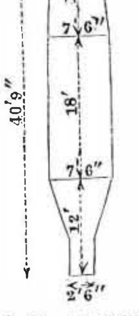

Fig. 10. Capacity 1,384 cubic feet. Charcoal blast furnace, Kärns, Sweden.

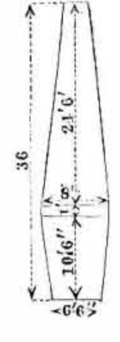

Fig. 11. Capacity 1,000 cubic feet. Charcoal blast furnace, Eisenerz, Styria.

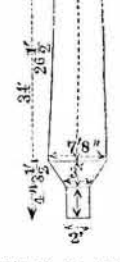

Fig. 12. Capacity 1,067 cubic feet. Charcoal furnace, Rothehütth, Hartz Mountains.

The diameter of the stack at the top varies from one third to three fourths of the diameter at the belly. In small charcoal furnaces, it is often not more than three feet, while in coke furnaces, it may be twelve feet or more, In general, it is considered advantageous to use wider tops than was formerly the practice; in the Hartz and in Sweden, the change has done excellent service. By narrowing the tops, the rate of outflow, as well as the tension, of the ascending gases is increased, and the heat is also drawn more to the point of exit; in consequence thereof, a part of the fuel is consumed where it is entirely wasted, and ores as well as fuel are not sufficiently prepared. This is especially objectionable where