SEAMLESS TUBES FROM SOLID BLOCKS OF METAL.*

In our age of great inventions a new discovery must be very remarkable to excite the interest of a large circle, and still the wonder of which we are about to speak has rendered the technical world, which is accustomed to strange phenomena, speechless with surprise. It has long been possible to mould iron and steel like wax under the steam hammers of our factories, but it would seem incredible to even the modern engineer that these substances could be as easily handled as they are now, thanks to this new invention. What was Vulcan's forge compared with the art of the present day?

REINHARD MANNESMANN.

Heretofore, when tubes were to be produced, the glowing metal was rolled into sheets between two hard rollers which worked parallel to one another, and then these sheets were riveted or soldered. If special strength was desired, the tubes could be bored or rendered more durable by being galvanized. Several years ago it was rumored that tubes had been successfully rolled from the block, and that tubes made in this manner had a resistance five or six times as great as that of tubes made in the ordinary way. This rumor was received with great incredulity, which was strengthened by the fact that the article did not appear on the market. Now the inventors, the Mannesmann brothers, have come before the public with their perfected method, and at one blow the technical possibilities of construction have been greatly increased.

In the Mannesmann machine the rollers are provided with spiral grooves and ridges and are placed at angles to each other. Their movement is in different directions, causing shoving and turning of the red hot metal bar placed between them, and when these impulses are thwarted, the surface of the bar is carried along, leaving the center or core stationary. The "skin" of the bar is literally "drawn over its ears," and thus the tube is formed. It is possible to make tubes which are closed at both ends, and it has been ascertained that such tubes contain a gas formed of a mixture of hydrogen and one per cent of nitrogen, which must have been pressed out of the iron.

The structure of the Mannesmann tubes is very peculiar, and the metal is treated in such a manner as to greatly increase the cohesion of every part. After repeated experiments it has been calculated that this new material will stand a pressure of 4,000 atmospheres, that is, each square centimeter of the tube can sustain a pressure of 4,000 kilogrammes (about 8,000 pounds). The machine operates with crushing strength. The inventors have succeeded in constructing fly wheels which store up from 8,000 to 10,000 horse power, which, when the brakes are applied, is given off again in 30 seconds, this being sufficient time for the completion of a 2 inch tube 4 meters long. The metal is kneaded like a soft mass, and there is no form that it cannot be made to assume.

The applications of the Mannesmann material are very numerous, and will make many changes in present technical methods, for it will be apparent to even the laity that these light tubes, to which any desired form can be given, and which retain the strength of a bar of metal, will admit of constructions which formerly seemed impossible. Thus an entirely new field is opened to bridge builders, who have found it difficult to obtain material which was sufficiently light, and at the same time had the requisite strength, for long spans. The new method will also be a great aid to progress in the manufacture of weapons. We rejoice that this discovery is the work of Germans, for we are often classed among the dreamers, and here is a truly practical invention.—*Ueber Land und Meer.*

Two minutes 8¼ seconds for a mile's trot was the wonderful time made by the four year old stallion Alabasteo, at Independence, Iowa, August 29.

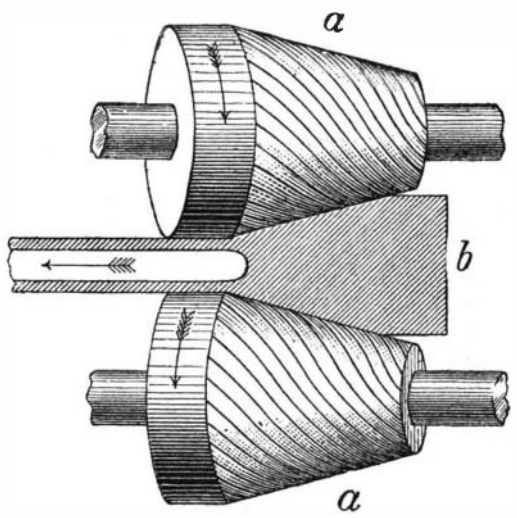
* For more full description of this method of making seamless tubes, with illustrations, see SCIENTIFIC AMERICAN SUPPLEMENT, No. 671.

Quick Ship Building.

The rapidity with which iron steam vessels may nowadays be constructed, when proper tools, machinery, and materials are at hand, is well exemplified by some of the English ship builders.

W. Doxford & Sons launched from their yard at Pallion, on August 16, a cargo steamer named Faizilka, built to the order of the British India Steam Navigation Company, Limited, of London, Glasgow, etc. This vessel is of steel, with cellular bottom fore and aft, and teak upper deck and poop bridge and forecastle, to Lloyd's 100 A 1 class. Her dimensions are: Length, 380 feet; breadth, 48 feet; depth, 29 feet 3 inches. The engines are the ordinary triple-expansion three-crank type, by Messrs. Doxford, the cylinders being 28 inches, 46 inches, and 74 inches, by 51 inches stroke, supplied with high pressure steam from three large boilers, capable of driving the vessel 11 knots loaded with 6,000 tons on a remarkably light draught of 23½ feet. She is for the East Africa trade. Her keel was laid on the 12th of May, so that she has been built in the space of three months and four days.

The Rangatira, lately built by W. Gray & Co., Limited, is nearly 400 feet in length, breadth 47 feet, depth 29 feet 4 inches, and is built to the highest class at Lloyd's. This vessel is the largest yet built at the port of the Hartlepools, and has a carrying capacity of about 6,250 tons. She has been fitted by Messrs. Shaw, Savill & Co. with two complete sets of the Haslam Foundry and Engineering Company's refrigerating machinery,



THE MANNESMANN PROCESS.
a a, the rollers; *b*, the block of metal.

the holds being lined all over with a non-conducting material, so as to entirely insulate them from the ordinary atmosphere. When fully loaded this vessel will carry over 70,000 carcasses. The main engines for driving the vessel have been supplied by the Central Marine Engine Works of Messrs. W. Gray & Co., Limited, and are of the triple-expansion type, working on three cranks. The cylinders are 27 inches, 43 inches, and 72 inches in diameter, with a piston stroke of 45 inches. Steam is supplied by three large double-ended boilers, containing in all twelve furnaces, all of which lead into one funnel, 10 feet in diameter. The working pressure of the steam is 160 pounds a square inch. On the measured mile the average speed on four runs was 11½ knots per hour.

MAX MANNESMANN.

Harland & Wolff, Belfast, have launched the steamship Georgian, 441 feet long, 45 feet beam, by 34½ feet deep, and is the largest cargo boat afloat, being capable of carrying nearly 7,000 tons dead weight. She is fitted for carrying cattle to the number of 1,000. Her holds are fitted up with refrigerating chambers for carrying dead meat, the system adopted for cooling being the Kilbourn Refrigerating Machine Company's.

A steel screw steamer named the Parkmore was launched recently by Charles J. Biggar, Londonderry. Length between perpendiculars, 340 feet; breadth moulded, 42 feet 4 inches; depth of hold, 28 feet 3 inches; gross tonnage, 3,500 tons; dead weight capacity, 5,000 tons on a mean draught of 24 feet. She has been specially constructed for trade between Liverpool and Boston and Baltimore, accommodation being provided for about 1,000 head.

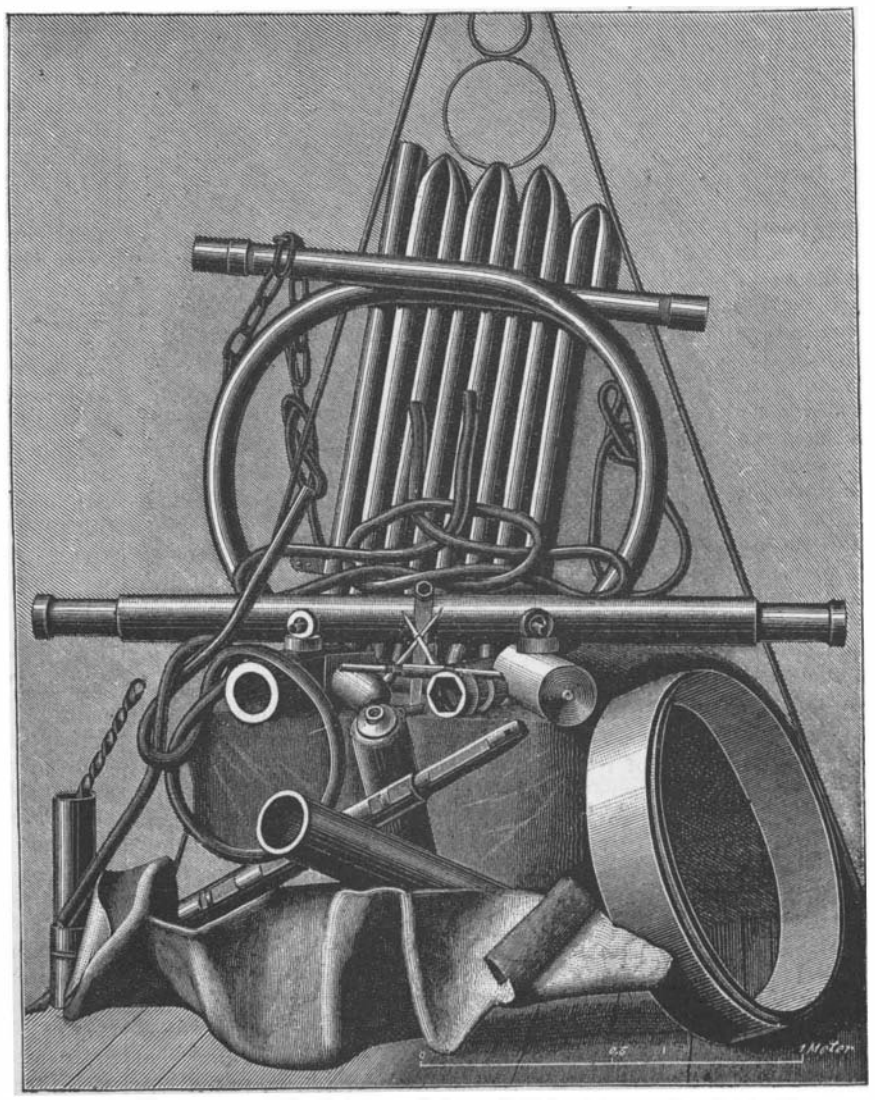
Can Consumption be Cured?

Among the subjects that came before the recent Medical Convention at Berlin, for consideration, was that of the treatment of pulmonary complaints. The question as to whether consumption can be cured, or whether it can be prevented among persons who inherit weak lungs, is one that has for generations excited the liveliest interest among medical men. Two reports were made to the Berlin convention on this subject.

Dr. Paul Gibier, of the Pasteur Institute in this city, who was a member of the Berlin convention, was asked by a *Sun* reporter what he thought the probable outcome would be of the reported recent discoveries relating to the treatment of consumption.

"I have received a copy," he replied, "of an elaborate report by Prof. Grancher, of the Pasteur Institute, Paris, that has just been made to the French Academy of Medicine, giving the results of experiments in preventing consumption by vaccination. The animals operated upon were rabbits. Briefly it may be said that the object aimed at by Professor Grancher is to make the rabbits consumptive proof. The virus is prepared from tuberculosis bacillus (the germ of consumption) and is of ten grades of strength. The inoculations were made at intervals of ten days, care being taken to see that the animals were in a perfectly healthy condition. After being subjected to this treatment the rabbits were inoculated with virulent virus, but no development of tuberculosis followed. The efficacy of the treatment was illustrated by inoculating other healthy rabbits, which had not been treated according to the new discovery, with the virulent virus. In all these cases tuberculosis was quickly developed, and the animals died. None of the consumptive-proof rabbits were affected. It will be seen that the treatment thus far is a preventive of the disease, but further experiments are being made with the hope of being able to apply the treatment, or one somewhat similar, to patients in which tuberculosis has been fully developed."

DANIEL QUICK, living near Atwood, Platt County, Ill., while digging recently a tile ditch on his farm, unearthed the remains of a gigantic mastodon. The tusks measure 12 ft. long and are 10 in. in diameter. Taking the tusks as a basis, the *Mastodon giganteus* was 12 ft. in height and over 18 ft. long. The skeleton would measure 17 ft. 5 in. in circumference. The skeleton was only three feet below the surface of the ground. This is one of the largest specimens of this species ever discovered.



SPECIMENS OF WORK DONE BY THE MANNESMANN PROCESS.

The Dangers of Electricity.

At the recent meeting of the National Electric Association, Cape May, President Dr. Henry Morton, President of the Stevens Institute, gave an interesting paper on the dangers of electricity. Among other things he says:

The Employers' Liability Assurance Corporation, after collecting a mass of material from a great variety of sources, has formulated a series of rules for the protection of those employed in erecting and operating electric apparatus involving the use of powerful and therefore dangerous currents. These rules have been examined and approved by several of the managers of prominent electric companies, and so far it would appear as if no accidents have resulted from the use of electric currents where these rules have been followed, and that most if not all the accidents which have occurred would have been prevented had these rules been followed and obeyed. As the author had something to do with the framing of these rules, his chief object in presenting the paper was to secure their criticism by those best able to perceive their imperfections, and such suggestions as may lead to their beneficial modification or extension. The rules are as follows:

1. Do not touch or handle any electric wire or apparatus of any sort while standing on the ground, or while in contact with any iron work, gas or water pipe, or stone or brick work, unless your hands are covered with rubber gloves, and you are provided with such properly insulated tools as have been declared to be safe and in good order by the electrician or other competent officer of this company.

If it is at any time necessary to stand on the ground, or on any surface not insulated from the ground, while handling electric wires and apparatus, rubber boots or an insulated stool should be used.

In moving wires hanging on or lying over electric light wires, lamps or fixtures, use a dry hand line.

2. Never handle any electric wire or apparatus with both hands at once when this can be avoided, and if it is necessary to do so, be sure that no current is present, or that one or both hands are protected by rubber gloves or other efficient insulation.

3. When handling line wires, treat each and every wire as if it carried a dangerous current, and under no circumstances allow yourself to make contact between two or more wires at the same time.

4. Never open a circuit which has been in use without giving notice to the superintendent, or whoever is in charge, of your intention to do so, and at the same time request that the same line be opened at the main station, and kept open until you have given notice that your work on that line is complete.

5. In the dynamo room never go near the belts or dynamos, nor touch any apparatus unless you are fully informed and instructed how to do so.

Tools used by linemen should be provided with insulating handles of hard rubber or other equally good insulator. It is the duty of each lineman to look after his own tools and see that they are in good order, especially as to their insulation.

6. Lamp trimmers and others engaged in the care of lamps must see that the switch putting the lamp in circuit is turned off before they handle the lamp in any way.

7. In construction work, a space of at least 20 inches must be left between the holes for pins on the cross arms, so that a lineman may get to the top of the pole and work without danger.

The same insurance association has collected the authentic records of a number of so-called "electric accidents" or accidents happening to the employes of electric companies. I have now before me the abstracts of 91 such cases.

Dr. Morton concludes as follows: "Of course I do not mean to imply by this that these rules are perfect or complete, but only that they seem to be in the right direction, and to furnish a starting point from which further developments may proceed.

"No one having even an elementary knowledge of electricity as it existed ten years ago needed or needs to be convinced of its power to do harm where all safeguards are removed; and the occasional declarations of its harmless character which have been uttered can only be accounted for by reference to that combative disposition which impels some minds always to take a view in opposition to any which may be expressed, and gives birth now and then to a book or pamphlet disproving the law of gravitation or the solar origin of light and heat. To say this is, however, far from agreeing with the other extremists who would banish electricity from our daily walks and occupations, or place it under restrictions which *might* render it harmless, but which *certainly would* render it relatively useless for the countless purposes in which its efficiency demands its full development.

"The true opinion is that which is supported by past experience, and which advocates the fullest developments of power to which this agency can attain, combined with the use of all the means of protection by which human intelligence can protect itself while using to the utmost this potent and, therefore, dangerous weapon in our victorious contest with the inimically destructive forces of nature."

A LADY SLIPPER ORCHID.

Hybridists are as diligent as ever in their operations among the lady slipper orchids, and one of their most recent additions is the handsome plant shown in our illustration. It was raised in the nurseries of Messrs. Sander & Co., St. Albans, England, from *C. superbiens* and *C. Roebeleni*, the latter being the pollen parent. At the meeting of the Royal Horticultural Society in the Drill Hall, July 8, it was exhibited and generally admired, receiving an award of merit as a recognition of its value.

C. Youngianum may be said to be intermediate between its two parents, as certain characteristics of each of them is at once noticeable to a practiced eye. The leaves are light green, having the upper surface traversed by longitudinal darker green lines, which are connected by means of dark bars. The strong, dull purple pubescent scape of the plant in question bore two large flowers, and, curiously enough, besides the usual bract at the base of the ovary, it also had another in the shape of a young leaf about a third of the

A LADY SLIPPER ORCHID—CYPRIPEDIUM YOUNGIANUM.
[From a drawing by Mr. John Weathers.]

way up. But this was probably an abnormal state of affairs, which is unlikely to occur when the plant blooms again. The upper sepal is creamy white, tinged with green at the base, and handsomely marked with dark madder brown stripes, while each of the intervening spaces is decorated with a row of spots of the same color. The lower sepal is not so large; it is white, with pale green stripes. The petals remind one very much of those of *C. Morganiæ*, but they are not so long nor so broad as in that fine hybrid. They are also white flushed with rose at the margins, which are fringed with dark grizzly hairs, and heavily spotted with madder brown on the front surface. The blunt, oblong pouch is of a soft olive brown color in front, passing into pale green behind, while the inflexed basal lobes are sparsely studded with small, reddish brown warts, and the surface of the pale green roundish staminode is marked with dark green reticulations. On the whole, notwithstanding its lateness in the field, *C. Youngianum* may be considered a success, and will no doubt take its place among first-class hybrid lady's slippers.—*J. W., in Gardeners' Magazine.*

BRICKS boiled in coal tar are rendered hard and durable, and machine-made brick, if boiled for a long period, say twenty-four hours, become waterproof. Bricks thus treated are well adapted for sewers, cesspools, and the foundations of buildings.

Gas Service Pipes.

Progressive Age, referring to gas pipes in our streets, states most truthfully that services are commonly made of a material that under conditions of moisture and atmospheric contact deteriorates rapidly. Under the frequently occurring conditions of moisture and the contact of soil containing salts, iron works refuse, ashes or manure, or subject to seepage of uric acid, wrought iron will rust out in a few years or months. Easy to lay and strong to resist crushing or cutting strain, it is, except for susceptibility to corrosive action, the ideal small diameter gas conduit. Steel pipe, which is stronger, has an advantage in its greater resistance to rupture while in the lathe or under the tongs; but aside from this it is practically the same as wrought iron as far as adaptability to service work is concerned. Where the corrosive action of the soil on iron is particularly bad, lead pipe is sometimes used for services. Except its resistance to corrosive action, everything is against it. First cost, ease of manipulation, strength, and resistance to cutting strains are all in favor of the iron or steel. If these could be adequately protected from the present ill effects of contact with corroding substances, little would be left to desire in the way of service materials.

Galvanizing or zinc coating naturally suggests itself. Against moisture and the oxidation due thereto this is a protection. But soil often contains corroding agents against which a zinc coating cannot protect an iron pipe. This fact is too well known to require proof. Something better is needed. Tar is extensively used. It helps somewhat, but it is, if ever only when used in quantity and with much care that it can be called a complete protection. Various compounds of tar, glue, rubber, etc., are used, and some with considerable success. They all require care in the preparation and application, add to the difficulties of laying pipe, and are easily removed by erosive action. It is not, perhaps, improbable that our successors in the next century will use a non-corrosive aluminum pipe for service work. It would be a near approach to perfection. But that is far in the future. At present the most encouraging prospect is in the direction of lead-coated pipe. We have seen, the writer states, samples to which the lead adhered so tightly that the abrading action of tongs and wrenches was not competent to remove it; and we have in our possession an iron nail, similarly coated with lead, which spent several months in a bath of corrosive acids without apparent damage. Evidently if this coating can be done at or near cost of galvanizing, lead-coated pipe is destined to have an extensive application to service work.

One fruitful cause of the destruction of service pipes the writer believes to be the grounding of telephone and telegraph wires over them. He has seen services honeycombed as the result of electrolytic action caused by the passage of small currents of electricity over them to damp ground.

He also believes that the question of tightness in a cast iron gas main is mainly one of joints; in a service, of the material of the conduit. To discover leaks in mains is comparatively simple. Bare down to the joints and you locate the smaller leaks. The large ones due to fractures ordinarily announce themselves. A service has almost the same liability to leakage at each point throughout its length, and the only thorough examination consists in stripping it. How important then it is that it should be properly laid, and of the most enduring material, which has the necessary strength to resist the strains which may ordinarily come upon it.

Locomotives for the St. Clair Tunnel.

The Baldwin Locomotive Works, Philadelphia, have the contract for building four decapod tank locomotives for service in the new railway tunnel under the St. Clair River between Port Huron, Mich., and Sarnia, Canada. These engines are to have cylinders 22 by 28 inches, five pairs of driving wheels 49 inches in diameter outside of tires, and will weigh in working order, including 1,800 gallons of water in the tank, about 180,000 pounds. They will have boilers 74 inches in diameter, carrying 160 pounds steam pressure. The firebox is 11 feet long by 3½ feet wide. There will be about 280 tubes, 2¼ inches in diameter and 13 feet 6 inches long. The cab is placed centrally over the boiler with foot plate and coal box at the rear of the boiler. The wheel base is 18 feet 3 inches. As the track through the tunnel is straight, the engines are not required to pass curves on the main line, and are only required to enter ordinary sidings. Additional play will be given the tires of the extreme driving wheels. The second and fourth pairs of driving wheels will be flanged with the usual play, and the distance between their centers is 8 feet 9 inches. The tires are to be secured by Mansell retaining rings, and each engine will be fitted with two sandboxes and two headlights, a Cooke steam bell ringer, and the Westinghouse automatic brake, with equalized driver brake fixtures acting on all the wheels. The fuel will be anthracite coal or coke. The load which these engines are intended to haul is about 760 tons, and the grades are 105·6 per mile. They are to be delivered in January.