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PLANT AND PROCESS FOR FIREPROOFING WOOD.

During the past year there were two tragic events, resulting from sudden and unexpected conflagrations, which made a profound impression, not merely on the countries concerned, but throughout the world at large. One of these was the swift destruction by fire, due to the shells of the American warships, of the Spanish cruisers engaged in the battle of Santiago, and the other was the awful conflagration by which the Windsor Hotel, in this city, was wiped out of existence with an attendant loss of nigh upon half a hundred lives. Although neither event taught the world anything that it did not know before, they both impressed deeply the lesson of the perils which are involved in the extensive use of wood as a material of construction where the risk of fire is aggravated and ever present. It has been commonly supposed that the Spanish ships contained a larger amount of woodwork than is usually found in warships constructed at the same date as themselves. As a matter of fact, however, they carried in the shape of decks, bulkheads, and partitions, no more woodwork, and indeed, not so much, as is usually found in cruisers that were built about the year 1890. So far from the conditions being favorable

Blowpipe Test.

for such a rapid conflagration as took place, they were actually unfavorable. The decks were largely protected on their under side by the deck beams, stringer plates and diagonal strapping, so that not only was the amount of under surface exposed to fire greatly reduced, but the large amount of ironwork in close contact with the overlying decks would, by conducting the heat rapidly away, tend to retard combustion. Yet it is a fact that these vessels had not been many minutes under fire before our shells had set them so fiercely ablaze that before the Spanish batteries had been disabled, it was necessary to run the vessels ashore in the effort to save the lives of the crews.

Naval men had been well aware, previous to the battle of Santiago, of the extreme peril involved in the presence of inflammable wood in the construction of warships, for at the battle of Yalu the Chinese gunners spent more time in putting out fires than in serving their batteries. The lesson suggested at Yalu received such a power of indorsement at Santiago and Manila that it is safe to say that every ship designed since the date of the Spanish war will be provided with as little wood-

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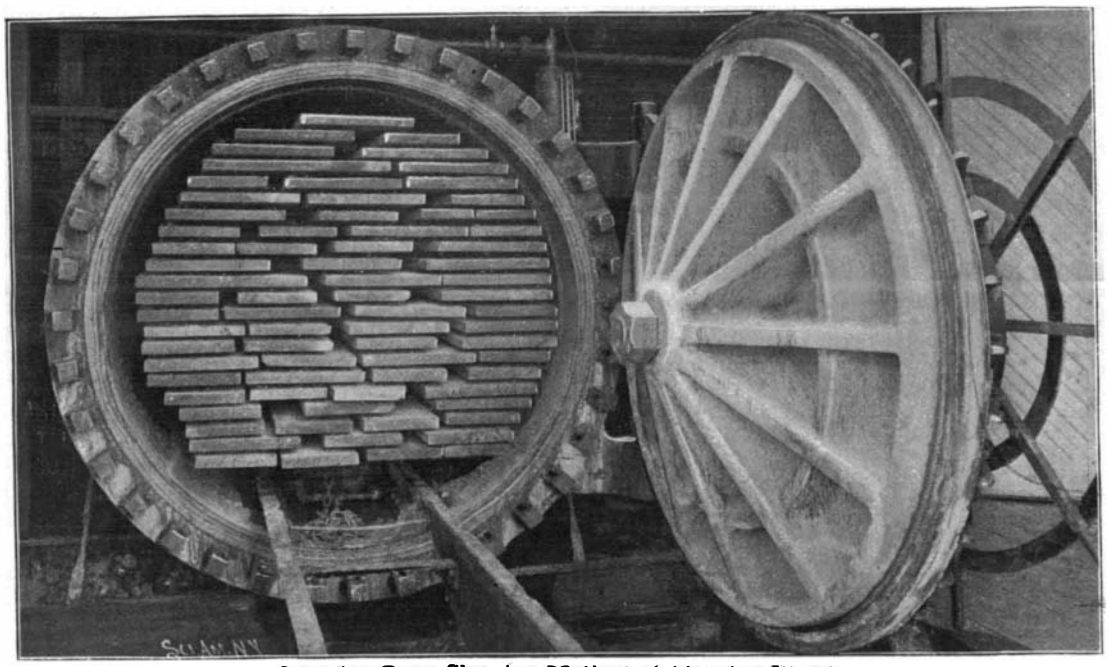
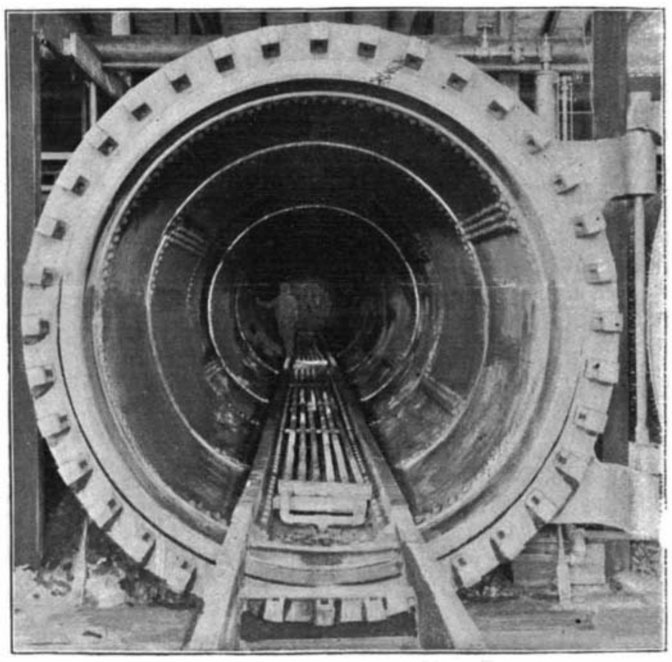
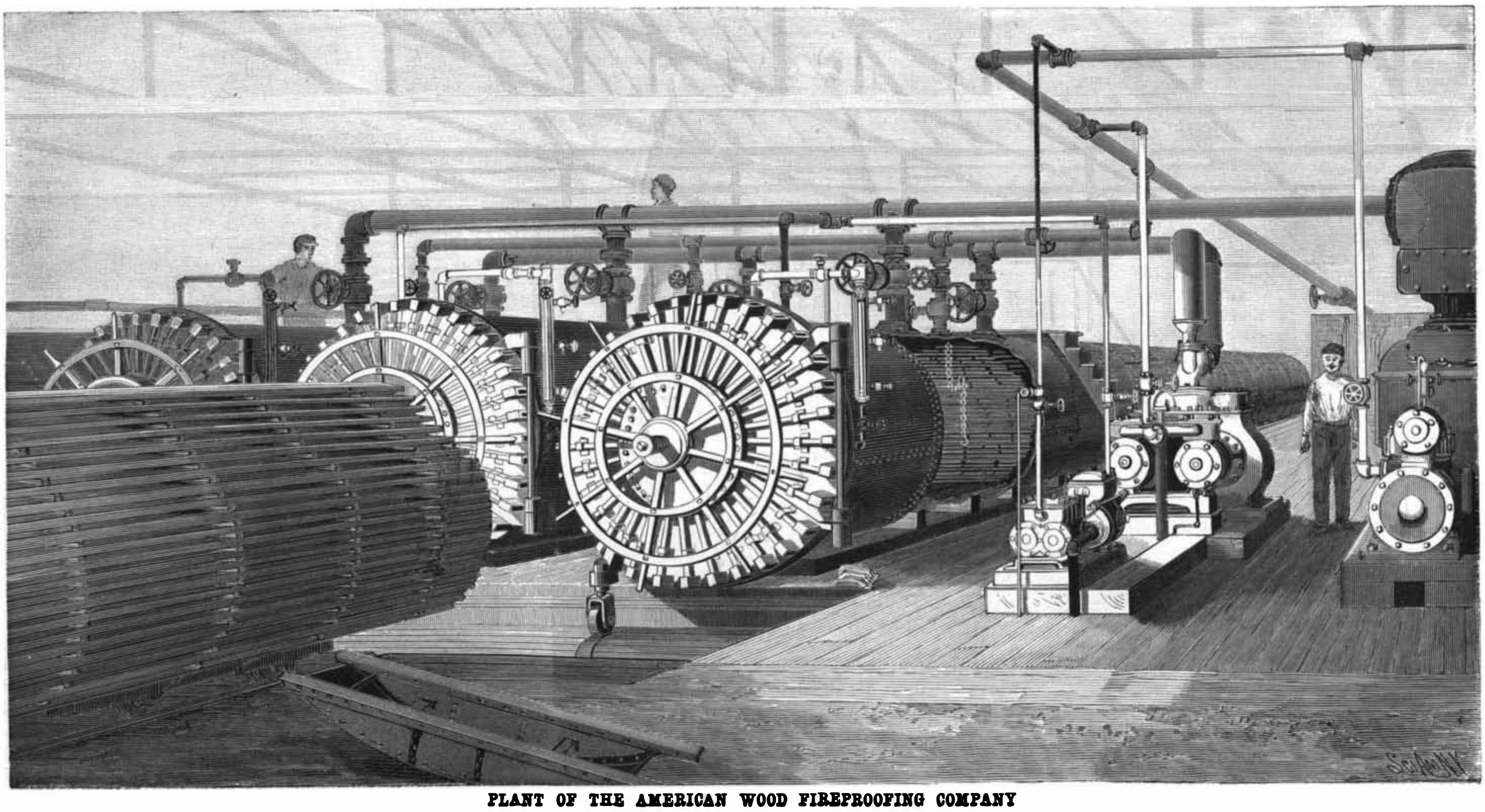


Digester Open, Showing Method of Stacking Wood.



Interior of Digester, Showing Tracks, etc.



PLANT OF THE AMERICAN WOOD FIREPROOFING COMPANY

PLANT AND PROCESS FOR FIREPROOFING WOOD.

(Continued from first page.)

work as possible, and what it carries will be rendered non-flammable by some system of fireproofing.

Of the many terrible conflagrations on land, we have quoted that which occurred last spring at the Windsor Hotel, because there is no question that the fearful rapidity with which the building was burned down was due to the large amount of wood which entered into its construction. It might also be mentioned that the destruction of the upper stories of the Home Life building, last winter, would scarcely have occurred, or at least would not have been nearly so complete, if the floors and general trimmings had consisted of non-flammable instead of untreated wood. It seems almost superfluous to emphasize the value of using for constructive purposes in any structure that is at all exposed to fire risk materials that are non-flammable and which in the presence of conflagration will add nothing to the fierceness of the heat.

The accompanying illustrations serve to give a clear conception of the methods adopted by a first-class fireproofing plant in the treating of wood. They represent the plant of the American Wood Fireproofing Company, of Newark, N. J.

As this is one of the latest to be put up, it may be taken as thoroughly representative of the present state of the art.

The plant consists essentially of three large digesters, which are built up of three-quarter inch flanged steel, and guaranteed to a pressure of 400 pounds to the square inch. Two of these are 6 feet 8 inches in internal diameter and 106 feet in length, and the third is of the same diameter and 32 feet in length. One end is permanently closed by a hemispherical head; the other end is provided with a massive cast steel hinged cover, 6 tons in weight, which is hung on a vertical hinge and may be swung to one side, as shown in our engravings, during the charging and emptying of the digester. It is provided with 36 heavy radial bolts, which engage the same number of sockets formed on the face of a cast steel flange on the digester. The locking bolts are of a rectangular cross-section and are cam-shaped at their outer ends, while at the center they abut against the inner side of a large plate washer. This washer is carried upon a massive screwbolt, which projects from the center of the cover, and is driven home against the cover by means of a massive threaded nut and hand-wheel, as shown in the general illustration of the plant. As the nut is screwed home, it presses the plate washer down upon the inner ends of the radial bolts, driving them into their several sockets and causing them to act with a cam-like effect to press the hinged cover to a snug bearing upon the face of the digester. A track formed of lengths of Z-iron runs the full length of the digester. A short piece of movable track is provided, by means of which these rails may be connected with the system of tracks which extends throughout the yard.

The wood which is to be treated is loaded upon small trucks until it conforms approximately to the curve and diameter of the cylinders, care being taken to observe a somewhat uniform spacing in order to allow a free circulation for the chemical solution with which the wood is to be treated. The timber is then secured to the tracks by iron bands and the trucks are wheeled into the cylinders and clamped down securely to the track. The end doors are then packed with a rubber gasket, swung to, and securely clamped. Steam is now admitted at a low pressure of about 10 pounds to the square inch, and the whole charge is submitted to a steam bath, which penetrates the wood, softening and loosening the dried juices which have remained in its fiber. The length of time during which the charge is subjected to the steam bath depends both upon the variety of the wood and its thickness, and it may be anywhere from one to fifty hours. After the steaming process is complete, a powerful vacuum pump is applied for a period of from three to fifteen hours, the vacuum as recorded by the gage being from 27½ to 28 inches. The immediate effect of the vacuum is to draw out of the cellular structure of the wood all of the saps, juices, etc., and leave it in a condition which might be described as that of an extremely finely divided honeycomb. When the vacuum treatment is complete, an alkaline solution is allowed to flow into the cylinders, great care being taken to prevent the entrance of any air. As the solution rises in the cylinders it is absorbed by the cavities of the wood until the latter is nearly saturated. To assist the absorption, the pressure pump is started and the pressure is raised to 200 pounds to the square inch, the pumping being maintained as long as there are any indications that the wood is absorbing the solution. The surplus is then pumped back from the cylinders to the storage tank, the doors are opened, and the wood is run out again to be stacked in the air for drying, or if so desired it is run directly into a drying kiln. In drying, the water evaporates and leaves all the inner walls of the cells covered with minute crystals of fireproofing salts.

This completes the process, and the treated wood is to all appearances the same as before it went through the operation. It contains all of its original properties except that by withdrawing all that remained of the juices the wood has been relieved of that portion of it that would tend to set up fermentation. Hence, incidentally, the treatment is a preservative one, for it substitutes an antiseptic in place of material which is the direct cause of dry rot. The treatment also has the advantage that the wood is so thoroughly filled that when it comes to be painted very much less oil is required than would be necessary in the case of untreated wood. Moreover, the fireproofed material is susceptible of a much higher polish even in the case of such soft woods as white pine and poplar.

Extensive tests of the treated timber have shown that the strength of the wood is slightly increased in some varieties, and slightly decreased in others, the average decrease of strength in all the varieties of timber that have been treated and tested being not over 5 per cent. Such a heavy impregnation with salts necessarily adds to the weight of timber, the increase being from 5 to 15 per cent, according to the variety that is under treatment.

One of our illustrations shows a little experiment which strongly illustrates the non-flammable quality of the wood. Not only is it impossible to ignite a shaving, but a strip of wood may be subjected to the heat of a blowpipe without any appearance of a flame, and nothing more than a temporary glow, which passes off immediately upon the removal of the blowpipe. This experiment proves that although the treated wood may be charred to a certain depth, beyond which the heat fails to penetrate, it is impossible for it to burst into flame and add to the heat of a conflagration.

The process as carried out at these works and above described has been approved by the recent United States Naval Board as being equal to any submitted to that board for test. The company has recently received a contract from the government to supply the interior wood construction for a building which is now being erected at the Brooklyn navy yard for use by the Ordnance Department of the United States navy for the storage of high explosives. The process has also been accepted by the Civil Engineering Bureau for use in the new executive building at the same navy yard, and the General Electric Company have now under treatment lumber to rebuild where fire recently damaged one of their buildings.

Notes on the Columbus Meeting of the American Association for the Advancement of Science.

An interesting paper was read in the chemical section by Wilder D. Bancroft, of Cornell, on the Relation of Physical Chemistry to Technical Chemistry. It was held that practically every process now used in technical chemistry can be improved in output or in economy. This improvement must come by a study of the reactions, and hence physical chemistry, which is a study of chemical reactions, is of paramount importance to the student who intends to take up chemical work.

Dr. H. W. Wiley and W. H. Krug, of the Agricultural Department, presented a paper on some new products of corn stalks, which was illustrated by a large number of samples. Among the products of greater or less commercial value are cellulose pith and compressed pith, for coffer dams and for lining the armor plate of war vessels, nitrocellulose for explosives, smokeless powder, and collodion—these from the pith —and from the outer part of the stalk, cattle and chicken feed, either alone or saturated with molasses and mixed with other substances, paper pulp, and nitroglycerin absorbents for dynamite.

Dr. Charles Baskerville, of the University of North Carolina, read a paper on the wide distribution of titanium. The experiments of Dunnington have shown it to occur in practically all soils; of Wait, that it occurs in the ashes of most, if not all, plants; of Wait and of Howe, that it is a constant constituent of bones and is probably present in most flesh, and now Dr. Baskerville shows that it must be considered as one of the constant constituents of the human organism.

Prof. H. A. Weber, of the Ohio State University, gave an account of the practical methods of testing soils for the application of fertilizers in use at Columbus.

Five drain tiles are partly filled with sand and placed erect in a box of sand. The upper part of the tile is filled with the soil to be tested. No. 1 is mixed with superphosphate, potassium sulphate, and sodium nitrate, Nos. 2, 3 and 4 with two fertilizers only, while No. 5 contains the soil alone. Fifteen wheat or oat or barley grains are sowed in each plot, and by their relative growth can be told the fertilizers needed by the soil.

Fifty-five papers were presented in Section C, but quite a number of them were read by title. The attendance in the section was very large.

OUT of 2,489 miles of railways in Switzerland, only 56½ miles are rack railways. There are nearly 12 miles of cable lines and 89 miles of street tramways.

Correspondence.

Class Experiment Showing How the Resistance of Carbon Falls with Rise of Temperature.

To the Editor of the SCIENTIFIC AMERICAN:

I am in the habit of giving an illustration of the decrease of resistance in carbon with increase of temperature, which commends itself by reason of its effectiveness and simplicity.

In a 110-volt circuit, I introduce a piece of charcoal some four or five inches long. The spark produced upon short-circuiting this stick at one of the contacts ignites the charcoal there. Then I slowly draw the short-circuiting wire from the ignited point zigzag along the surface to the end. The glow follows the wire and is maintained. Thus the current keeps to the path it has "blazed" for itself throughout all the fifteen or sixteen inches of meandering, preferring the road that is hot, though long, to the short but uninviting chilliness of the straight line.

I. J. KAVANAGH, S.J.

St. Mary's College, Montreal.

Automobile News.

A new automobile journal entitled Die Automobile is to be issued fortnightly in Berlin.

The Automobile Association in Germany, according to The Cycle Age, are continually arranging tests to help to popularize the motor vehicle.

It is said that a test of a gas engine automobile will be made by carrying a message from Brig.-Gen. Anderson, at Chicago, to Maj.-Gen. Merritt, at New York.

The police department of Hartford, Conn., will soon be equipped with automobile patrol wagons, ambulance, and prisoners' van. There are great possibilities in the way of the use of automobiles for municipal work.

An electric brougham in Boston was recently upset through the collapse of the front wheel tire, and its two occupants were badly scared, although they were not injured. The front tires of broughams and the rear tires of electric hansoms are those most liable to punctures and other injuries.

It is reported that the New York Central Railway intends to establish an electric cab service in New York and other large cities along the line, and the Pennsylvania Railroad has been experimenting with a sample vehicle, and it is possible that these carriages may be substituted for the horse-driven cabs at the stations of the company's system.

An automobile ambulance is being made for St. Vincent's Hospital, New York city. It will be propelled by electricity, and will be a model of its kind. Electric power is more advantageous for propelling a vehicle where it is essential to have a very steady motion. The large pneumatic tires, it is expected, will also contribute in no small degree to the comfort of the patient.

It is probable that the maximum speed allowed to automobiles in Paris will be greatly decreased, and also that persons must possess certificates as to their knowledge of and ability to run automobiles. In a single week The Electrical World says that eight persons were killed and as many as fifty injured through automobile accidents in and near Paris. In nearly every case these accidents were owing to rapid traveling or to the ignorance of the drivers.

A Bridge Destroyed by Electricity.

The bridge over the Wabash River at Clinton, Indiana, was recently destroyed with the aid of electricity. It was a wooden bridge resting on stone piers and it was very essential to have the bridge removed by a certain time. Of course, dynamite could have been used, but the explosion would have injured or destroyed the piers, and if the bridge was set on fire it would have cracked or injured the masonry. An electrician agreed to wreck the wooden structure without injuring the piers. Each span of the bridge was composed of nine chords, each consisting of three timbers. If the twenty-seven sills were cut simultaneously, the spans would drop into the river at the same instant. This was actually done, the cutting being accomplished by burning through the wood by loops of iron wire made hot by the passage of the electric current. No. 12 wire was used for the loops, and at the bottom of each loop a five-pound sash weight was fastened to an insulator. This weight pulled the loop down as it burnt its way through the timber. According to The Western Electrician, an alternating current of fifty volts pressure was employed. One span was wrecked at a time, and the total time which elapsed from the turning of the current until the fall of the span was one hour and forty minutes in each case. After the fall of the bridge an examination showed that all of the sills were burned by the wire loop in exactly the same manner, five inches deep on the top and three inches deep on the sides. When this depth was reached the weight of the span fractured the remaining wood. The cut was sharp and clean and the wood was not charred more than an inch from the place of the fracture. Two thousand spectators witnessed the feat.