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Contents:

(Illustrated articles are marked with an asterisk.)

SIX MONTHS OF PROGRESS IN MECHANICAL AND CIVIL ENGINEERING.

The close of the present volume affords a convenient opportunity to review what has been done in the mechanical world during the time of its publication. We shall find little that is new or startling in the way of discovery but that considerable work has been done, and some steady progress has been accomplished.

The department of civil engineering may boast of the active commencement of one of the greatest feats of engineering of modern times, in the building, launching, and placing of the great caisson, at the Brooklyn terminus of the East River Bridge. Descending into this vast structure, if one has sufficient physical strength to withstand the pressure, he may see a large gang of men busy as bees in a hive, laying the foundation for the enormous superstructure. Everything is progressing with that smoothness and absence of unforeseen contingencies which gives assurance of the successful completion of this great work.

The Suez Canal has been greatly improved, so that ships of the deepest draft now find no difficulty in making the passage.

The proposed Darien Canal has been made the subject of careful survey, and its possibilities and probabilities are becoming daily more determined.

A new explosive, dualin, has been added to the list of compounds employed for blasting, but its merits are still not so fully demonstrated as to secure the confidence which it perhaps deserves.

The question of street pavements has received more light from some successes, and by far more numerous failures. A new kind of pavement called Dura Pavement, from its resistance to wear, is now laid in small sections in several places, and seems to promise well. Experiments with the French asphalte, and with artificial imitations have also been made, but we think not with great success.

The preservation of brown sandstone, which has become so popular as a building material, has also been the subject of experiment; and concrete building, as well as the manufacture of artificial stone, has been slowly but surely advancing.

Our readers will recollect some editorial remarks upon the subject of "Improved Building Materials," published not long since in this journal. The subject will bear further attention in connection with recent improvements.

There seems to be a general effort now making to produce cheaper and if possible better building materials than have hitherto been employed. Our exchanges from abroad, more especially those devoted to architectural topics, give us very encouraging accounts of the progress of concrete building. This style of building seems growing in favor, and is furnishing a very good class of dwellings at a very cheap rate.

We find also an account of a new kind of artificial stone, called the Victoria stone, which seems to have endured severe tests and to promise well.

It is the invention of a clergyman, Rev. H. Highton. The process by which it is made consists in mixing broken granite with hydraulic cement, and steeping the whole when set in a solution of silica. The granite used is the refuse of the quarries, and is broken up at the works. It is then mixed with Portland cement, in proportions of four of granite to one of cement, sufficient water being added to give it a pasty consistency. In this state it is placed in molds, when it consolidates in about four days. When taken from the molds it is placed for two days in a solution of silicate of soda, which completes the process.

The silicate solution is prepared in a peculiar manner, and upon it the success of the operation depends. The silicate of soda has the property of hardening any kind of concrete in which lime is a component. This substance has been hitherto too costly for general use in artificial stone manufacture, and it becomes caustic by the absorption of its silica, so that it attacks the hands of the workmen.

Mr. Highton produces his solution in the following manner. He uses a soft kind of stone containing twenty-five per cent of silica, found at Farnham, in Surrey, England. This stone readily dissolves in a cold caustic soda solution.

The solution of soda is placed in the tanks used for steeping the stone, and the Farnham stone is ground and added to the bath. The lime in the artificial blocks removes the silica from the solution, which in its turn takes up more silica from the Farnham stone, and so maintains its supply of silica, thus removing the objections above named. The process is extremely ingenious, and we are informed that flagging, sinks, mantels, coping, cap-stones, sills, etc., are produced by it. Finely cut moldings are not successfully produced, and it seems better adapted to a heavier class of work.

In America also considerable improvement is observable in this field. We recently noticed an excellent stone manufactured in this city. A Brooklyn paper states that porcelain enameled bricks are now produced by a firm in that city, of great beauty, both for outside and inside work, and a cost not exceeding that of Philadelphia pressed bricks.

The adaptability of zinc for certain architectural purposes is also attracting attention, and is growing in favor. It is formed by pressure into ornaments both for outside and inside decoration, which when painted resemble, very closely, cut stone or stucco, as the case may be. These ornaments are both cheap and durable.

The Pneumatic Tunnel under Broadway, New York, has been commenced, and so skillfully conducted as not to disturb surface travel in the least. This tunnel when completed and put in operation will be the largest work of the kind in existence.

Prof. Norton, of New Haven, has been testing the hitherto admitted laws of the deflection of beams, by rigid experiment, with results varying from the hitherto accepted formulæ. His experiments, of which a notice appeared on page 256, current volume, are worthy of the attention of engineers, as the laws in question lie at the very root of scientific construction.

In rock-drilling machines, some improvement has been made, but the progress in this portion of the engineering field has been limited mostly to the more general adoption of machines already invented, than to the invention of new machines. Power is gradually superseding hand labor here, and is probably destined to be ultimately used in all extensive works where such drilling is required.

A submarine blast of unprecedented magnitude was fired in the harbor of San Francisco, on the 23d of April, by which Blossom Rock, a dangerous obstruction to commerce, was entirely removed. The rock known as Hell-gate in the East River still remains an obstruction, but it is stated that a large quantity has been removed by drilling and blasting. Our opinion is that unless some other means than are at present applied to its removal are adopted, it will be a long time ere this obstinate rock will be subdued.

In steam engineering no marked advancement has been made, although many devices tending to increased safety in the use of boilers have made their appearance. The past six months have been extremely fruitful of disasters from explosions, which shows that practice in boiler making, or in boiler tending, or perhaps both, are retrograding rather than advancing.

In miscellaneous inventions there has been considerable activity, and many useful devices have been brought to public notice. It shall be our aim in the coming volume to keep pace with all new improvements, and to render the SCIENTIFIC AMERICAN in the future, as it has been in the past, the best and most reliable record of progress published in this country.

THE CLOSE OF VOLUME XXII.

In closing the present volume we feel a natural pride in the fact that notwithstanding a host of competitors have sprung up in the various cities of the Union directly or indirectly calculated to obtain a share of the patronage of the class of readers for whose interest and instruction we have so long labored, we find our subscription list larger than ever before at this season of the year. The general tone of our correspondence also assures us that never before has the SCIENTIFIC AMERICAN held so high a place in the esteem of the reading public as at this moment.

We feel that we may entertain a just pride also in the very large variety of original matter contained in the present volume. No technical paper published in the English language has touched upon such a wide range of topics, or given information in a more popular and readable form. While then we look upon our extending circulation with satisfaction, we feel that our success is but the reward of earnest endeavor and unremitting labor to perform all that we promised in our prospectus at the beginning of the year.

We feel that our full performance of our promises to our readers also entitles us to confidently solicit their co-operation in further extending our circulation. There can be no investment for which a greater return is sure to be obtained than a subscription to this journal. Nothing comparable to it in size or in fulness of valuable contents is published for anything like its price, and its information is always gathered from reliable sources. We hope, therefore, our readers will feel like giving a good word to their friends and neighbors in our behalf, and that they will feel certain of their reward for this slight trouble in our continual effort to place weekly in their homes the most readable, instructive, and reliable paper published in the world, upon such matters of general, technical, and current interest, as comes within our sphere.

To our numerous exchanges we extend thanks for the many courtesies for which we are indebted to them, and the many favorable notices and compliments by way of copied and accredited articles, we have received at their hands.

Pledging ourselves that we shall in no way slacken our efforts to keep full pace with the advancement of the age, we shall commence Volume XXIII. with the determination that although others may compete with, they shall not excel us.

DANGER OF EXPLOSION AND COLLAPSE IN KITCHEN BOILERS---HOW TO AVOID IT.

Whether from the better construction, and more scientific arrangement of kitchen boilers in this country, or whether because cases of such explosion are not deemed sufficiently sensational to be generally reported on this side of the Atlantic, certain it is that we read of three such accidents in foreign journals, to every one that we find reported in our American exchanges. Yet there is no nation in the world that makes such an extensive use of modern improvements of this class as the American.

Such accidents, however, do happen here, and that they do not happen more frequently is certainly not due to want of facilities afforded by plumbers.

For the most part the pipes and boilers in dwellings are left in charge of servant girls, who know very little about steam or hydraulics, and many of these arrangements are constructed on principles to understand which requires not a small degree of such knowledge.

In his absence one day, notification was given to people at the residence of the writer, that the water was about to be turned off from the street, by a contractor, and directions were left to extinguish the fire, which, it was stated, would prevent any injury to pipes or boiler. Relying upon this instruction, they succeeded admirably in doing two very disagreeable things, namely, substituting a cold lunch for the usual dinner at 6 P. M., and collapsing the kitchen boiler into the shape of a very dilapidated hat just rescued from beneath the foot of an elephant.

Shortly afterwards this boiler, which had been re-rolled and repaired, was collapsed in another way. Too great heat had generated so much steam that the water was forced entirely out of the boiler. The servant, slightly opening the faucet, was alarmed at the volume of steam which escaped, and shut off the flow; this threw a jet of water in from the supply pipe, which suddenly condensed the steam, and before water in sufficient quantity could flow in to supply its place, the boiler was again suddenly flattened out.

These are the most common ways in which such boilers are collapsed, where the supply of water flows in directly from the main, as is usually the case in this country. The rarity of bursting is probably due to the fact that the head of the water limits the pressure of the steam, and the boilers are originally made to safely withstand the pressure due to the head.

We know, however, of cases where the lead pipes leading to the boilers have burst by the action of steam forcing hot water back into them and thus weakening their tenacity.

These accidents may be avoided by a proper arrangement of valves. Every boiler of this kind should have a valve opening inward to prevent collapse. It should be made strong enough to withstand considerably greater pressure than it will be subjected to by virtue of the head. Then if a check-valve be employed to keep the water from being forced back into the pipes by the steam pressure, and a safety valve be set to blow off at, say, five pounds above the maximum pressure due to the head, the boiler can neither burst nor collapse under any circumstances, and will need no care to guard it against the ignorance of servants.

THE DAWN OF AN IMPORTANT INDUSTRY.

In the year 1832, Professor Dumas, the eminent French chemist, discovered among the products of the distillation of coal a new body, to which he gave the name of paranaphthaline, but which was afterwards called anthracene. When coal tar is subjected to fractional distillation a heavy oily matter comes over, which, upon exposure to a temperature of 18° Fah., deposits crystals of naphthaline and anthracene. The crude material is treated with alcohol, which dissolves the naphthaline and leaves the anthracene unattacked. The latter body can then be purified by further distillation.

Anthracene boils at 350° Fah., and is soluble in turpentine, but not in alcohol. It does not seem to be formed at low temperatures, but at the heat required to manufacture gas it sometimes comes off in sufficient quantity to make its appearance like snow in the purifiers, and also in clogging the pipes. It is therefore as an incidental product of the gas house that we are to look for this substance side by side with the benzole, carbolic acid, and lubricating oils now so extensively made from tar.

Berthelot and Limpricht have succeeded in making anthracene artificially, but the process is too complicated for practice on a large scale, unless materially modified by further experience. It is not many years since coal tar was thrown away. The gas companies allowed anyone to take it who