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MACHINERY IN THEATRICAL REPRESENTATIONS.

The term "machinist" may by some of our mechanical readers be considered as misapplied when used to denote the builder and manager of the contrivances employed behind the scenes of a theater. But very much of mechanical skill is required to produce the effects witnessed by the audience at any of our first-class theaters. Having visited one of the popular theaters in this city known for the excellence of its mechanical effects, we will note some of the appliances employed. The stage, with its appurtenances and the rooms connecting, occupies more of the space included within the walls of the theater than the auditorium. Descending two full stories below the stage and ascending two above, the "behind the scenes" is an immense workshop where mechanics in almost every branch ply their several trades. Without attempting to describe the different departments in detail, we will endeavor to give briefly an idea of the strictly mechanical devices by which effects are produced.

The floor of the stage is made in movable cross sections, of southern pine plank, of sections varying from ten inches to three feet in width and ten to fifteen feet in length, traversing inclined slides secured under the floor. These slides incline from the center of the stage toward the ends, these portions of them being depressed enough to allow the thickness of the planks to slide under the floor. The movements are effected by means of ropes secured to the sections and wound upon strong winches beneath the stage. The slides are lubricated with dry, powdered plumbago, without a particle of oil. When the sections are closed the outer ends are elevated to the level of the rest of the floor by cam levers which hold them securely. Through the openings thus made in the stage the scenes which rise to slow music in the piece are elevated. One of these, the grand "transformation scene," weighs not less than six tuns with its load of humanity. To effect this result immensely strong geared windlasses are employed, turned by a number of men who work in perfect accord. Guiding bars of two-inch iron and lifting apparatus in which five-inch ropes are used, afford perfect security.

This machinery is all situated two stories below the stage, a distance of about thirty feet, to give room for the hight of the scenes. Both day and night this subterranean apartment is lighted by numerous gas jets. All the machinery is of the strongest description; in fact strength rather than elegance has been the rule in its construction. The machines for lowering the scenery from above the top of the proscenium are also located here, iron braces, strong ropes, and heavy timber being the agencies for the transmission of the power. Two heavy double force pumps with two-inch hose are also fixed in this sub-basement, intended either to force water in torrents to any part of the building in case of fire, or to supply the water for a cascade in one of the scenes, or to pump it up from the receiving reservoir to the hight necessary to reach the waste sewer.

The cascade mentioned above is as real as any in nature, except that the rocks are made of zinc, soldered water tight and painted. Other minor cascades are merely rotating cylinders covered with gauze, flecked with mica and having a strong light thrown upon them by rows of gas jets. Gas and lime lights perform no insignificant part in the spectacle. In one scene the light changes from a cadaverous green to a ghastly blue, gorgeous red, and brilliant white. This is effected by changing the lenses of the lime lights, situated in the wings at an elevation of twenty feet from the stage, and aided by cylinders covering rows of gas lights made of the different colored gauzes disposed in longitudinal sections.

The work of the "property man" and "carpenter" with his assistants demands also considerable mechanical skill and talent. For instance, the "crystal columns" in a "ball room" scene are semi-cylindrical and about twenty feet high. They are built of timber and mounted on trucks, the capitals being much heavier and larger than the bases, yet the weight is so distributed that there is no top-heaviness nor danger of overturning in moving. The ornamented capitals are of papier maché, molded in plaster of Paris, which molds must be fashioned by hand, or rather the patterns from which they are made. The angles of the uprights of which the shafts of the columns are built, are so arranged as to reflect the gas lights inside the columns to produce a dazzling effect. This requires mechanical skill and a thorough knowledge of optics and of the effects of light on the surfaces of differing angles.

All the work is of the strongest possible character, to insure against accident, and every part of the ponderous machinery is calculated to move with the greatest ease and in perfect concert with every other part.

THE STEAMER "BRISTOL."

With the exception of her consort, the *Providence*, no such magnificent ship has ever been built for sound or river navigation as the *Bristol*, of the Narragansett Company's line between New York and Boston. On the 11th of June she made her trial trip, and in all respects this, her initial effort, was an entire success, but it is a cause for regret that the original significant names of these two vessels, *Puritan* and *Pilgrim*, should have been changed to *Bristol* and *Providence*, names of merely local significance.

The *Bristol* is a ship of about 3,000 tuns measurement, built in all respects like a first-class sea-going ship, and yet combining all the space, elegance, and airiness of the best sound and river boats. Water-tight compartments, immense rigidity and strength of hull, iron braced and securely bolted, strengthened by hog braces, make this ship one of the staunchest that ever floated. The solidity, beauty, and luxury of her internal fittings, upholstery, furniture, and arrangements are beyond dispute unequaled.

But the machinery is eminently superior. Her single beam engine of 110 inches diameter and 12 feet stroke, the largest, with the exception of that of the *Providence*, ever run on a ship, is a model of fine workmanship and easy manipulation. It is furnished with the Sickles' cut-off with the latest improvements. Her wheels, of wrought iron, are 38 feet, 8 inches diameter, the buckets of each wheel being in two sections, the buckets of one alternating with those of the other, and one wheel being placed relatively to the other, so as to obviate the trembling and jar generally so perceptible and often so annoying on steamers. The iron rims of the wheels are knife edged to diminish friction.

The boilers are three in number, and instead of being arranged upon the guards of the vessel, are placed entirely below deck, their weight and that of the water they contain thereby giving stiffness and stability to the vessel in heavy weather. This also admits of the guards forward of the paddle wheels being so narrow as to present little obstruction to the sea. The boilers are 35 feet long and 12 feet, 6 inches diameter, flues below and return tubes above. The furnaces, four to each boiler, are in two tiers, one above the other, the flames and heated combustible gases from the two meeting in one connection common to both, where the hot gases and any uncombined air are so thoroughly mixed as to insure perfect combustion. The total amount of grate surface is 510 square feet, and the fire surface 13,850 square feet. This large grate surface is expected to be adequate to burn the coal by natural draft alone, without the employment of "blowers," which, by producing intense combustion in a small space, are very destructive to the boilers. Another advantage of the natural draft is that it ventilates the stoke hole and causes less suffering to the firemen from heat. The boilers are constructed according to a patent obtained by Erastus W. Smith, A.P.D., the constructing engineer for the line. It is expected that, by the use of natural draft and of the fresh water from the condenser, the duration of these boilers will be nearly double that of boilers using salt water and blowers. The condenser contains 4,000 square feet of tubular condensing surface. The tubes are of brass, without seam, drawn from solid ingots, by the American Tube Works, of Boston. They are tinned inside and outside to prevent galvanic action; and, as they are packed with wood ferrules, according to Horatio Allen's patent, all the difficulties of surface condensation, so long troublesome, are overcome.

The steam chimneys are located on the two outside boilers and pass up through all the decks. They are inclosed in a boiler-iron case, firmly riveted and bolted together. Between this case and the steam chimney is an air space of 18 inches the entire hight and circumference, admitting of good ventilation. The case also supplies complete protection to the passengers in case of leaks to the flues or tubes.

The provisions against danger by leakage and fire are admirable. If need be, in case of leakage, the whole capacity of the circulating pump to the condenser can be applied to the bilge, which would discharge two hogsheads at each revolution of the engine. Three other effective pumps also connect with the bilge of the vessel. To provide for the extinguishing of fire there is an independent steam fire pump set apart in a room with a separate boiler, for use when the large boilers are not at work. From this fire pump or engine, branches off a large copper pipe with branches fore and aft the vessel, and up through all the state-room saloons on to the hurricane deck, connecting with numerous smaller branches fitted with freely-opening water gates and coils of hose all ready attached for immediate use. In addition there is an arrangement for extinguishing fire in the hold by steam admitted through pipes, the key of which is intrusted to the engineer only.

The hull was built by Wm. H. Webb, Esq., under the supervision of Capt. Jed. Williams, and the boilers and engine by Messrs. John Roach & Son, of the Ætna Iron Works, this city. In every respect the description of the *Bristol* applies to the *Providence*. Both are marvels of capacity, strength, power, and elegance. They run between New York and Bristol, R. I., where they make connection by rail—a ride of an hour and a half—to Boston.

On the first trip of the *Bristol* to Bristol, R. I., fourteen miles above Newport, in Narragansett Bay, her time was nine hours, fourteen minutes from the Battery, a distance of 160 nautical miles. time never but once surpassed on a similar course. Her subsequent trips have exceeded this time. Mr. Harrison O. Briggs, of Boston, Mass., is the general manager for the company.

ELECTRICAL ANTI-INCRUSTATORS.

We observe that the *Railway Times* gives prominence in two successive numbers to remarks before the Polytechnic Institute on a new remedy for boiler incrustation, as reported in this paper. We do not object to seeing our report credited to another journal, if it is to be construed as countenancing the slender theory there explained as the basis of another patent electrical anti-incrustator. As a company is said to be forming to manufacture apparatus under the patent, and quite possibly may get as much commercial success at the expense of boiler owners as the not much more meritorious contrivances already in the field have met with, a word on the fallacy involved may be opportune for some of our readers.

The inventor bases his expedient on the existence of a positive electrical state in the suspended salts carried up into the steam space. It need not be denied that the low conductivity of steam favors a sustained slight disturbance of electrical equilibrium during its rapid disengagement. But it is needless, too, to point out that uninsulated bodies in connection, like the boiler and its contents, whatever they may be, cannot sustain an active electrical state of any practical consequence. The most they could do in the circumstances would be to supply an indication through a delicate galvanometer. The proposal, therefore, to collect this trivial amount of electric force upon metallic points and convey it to the boiler iron so as to obtain a discharge between the iron and the salts which was not attained before by the free contact of the two, is refinedly visionary. The Doctor should never say a word against homœopathy. As for deposits enveloped within so good a conductor as water, the notion of employing their electrical activity has not even a theoretical basis.

THE ALBANY RAILROAD BRIDGE.

Our engraving represents this structure as it appeared in March, 1866, which was shortly after its completion. Some years have elapsed since the first inauguration of the enterprise, which delay was occasioned by litigation on the part of Troy and other interests upon the river above Albany, but finally all obstacles were overcome, and the work on this bridge was commenced in April, 1864. The first locomotive the *Augustus Schell*, of the Hudson River Railroad, crossed the bridge Feb. 15, 1866, and the first passenger train on Feb. 22.

The bridge proper (omitting the approaches, which in them selves are quite formidable) consists of two abutments and nineteen piers, making a total length of 2,020 feet. The extreme length of the bridge is nearly a mile. The main channel of the river is crossed by four spans of 178 feet between the centers of the piers, on the plan known as "Howe's" and and two draw spaces of 131½ feet each. The remaining 14 spans over the shallow water on the east side, as also over the basin on the Albany side, are short spans ranging from 75 to 78 feet each, built on the same general plan. The trestle work approach to the bridge in the city is about 1,500 feet long.

Our view represents the bridge from the Albany Basin to the eastern shore, at seen from the large New York Central Railroad Elevator, which stands a few rods south of the bridge.

The drawbridge, including the iron turn-table upon which it rests, is entirely novel, planned specially for the locality, and the circumstances under which it has been built and will be operated. The piers and abutments are all founded on piles. In some cases the bed of the river was excavated to a depth of ten or twelve feet, and within this space piles were driven to the hard bottom, sometimes as low as thirty-three feet. A heavy timber crib was then built around these piles of the dimensions of the proposed pier, resting on the bottom of the excavation, and reaching to within three feet below water mark. This crib was then filled with concrete and floored with heavy timber, upon which the first stones of the masonry were laid. In other cases, after excavating as before, and driving the piles, the latter were sawed off, and a floating caisson, with a heavy timber floor, of the dimensions of the proposed pier, was anchored over the piles, and the masonry commenced in this caisson, which soon settled to its bearing on the heads of the piles, when the sides were removed by unscrewing some bolts, and floated away to serve elsewhere.

The piers are of cut limestone masonry, with rough faces,