Correspondence.

Carelessness of our Railroads.

To the Editor of the Scientific American:

Your article on "Automatic Safety Appliances" (September 29) struck me as being very timely and suggestive, especially so in regard to railway appliances, the air brake in particular. I have been surprised to see the number of accidents that have occurred in the past year from the failure of the air brake to work at critical times, involving a great loss of life and destruction of property. My attention has been called to these accidents in particular, because I think that most of these accidents could be avoided if the railroads of the country showed more enterprise and examined the different safety appliances that are offered for their consideration. But I know from personal experience that it is of no use to try to get a hearing from the prominent railroad companies of the country, the almost invariable reply being, "We have adopted a standard brake and coupler;" and instead of encouraging the inventor, do all in their power to discourage and keep him in the background.

It seems to me that no relief can be expected from the railroad companies until a little more desire for safety is exhibited and less desire t run their roads at the least possible cost. My opinion is that it should be part of the duties of the Railroad Commissioners (appointed by the State) to examine and test (when in their judgment the merit of the invention calls for it) the different railroad appliances submitted to them and report as to their merit, and recommend the adoption of those that would best insure the safety of life and property. I think that they could not better serve the State and the public at large than by giving attention to these important matters.

GEORGE F. BOND.

The Power of a Locomotive under Full Headway.

To the Editor of the Scientific American:

Thinking the following might be of interest from its peculiar nature, I send you particulars: About five o'clock on the afternoon of the 8th inst., while a construction train on the Lowell branch of the Boston and Maine Railroad was backing down on the main track, it was struck in the rear by an approaching train, demolishing two cars. In the excitement of the moment the engineer of the construction train opened the throttle of his engine instead of closing it, and both men jumped off. Under the extra pressure of steam the locomotive broke the connection with the train and started alone for Lowell.

Meeting with no obstruction on the way, it plunged into the depot at a rate of speed estimated at 60 miles an hour. The first obstacle encountered was the heavy bunter at the end of the track, which was torn up and lodged on the cowcatcher; it next tore up the planking and beams of the floor and demolished one end of the baggage house; it next encountered a brick partition about 18 inches thick, which was scattered in all directions; after passing through this wall it traversed the length of the U. S. and C. express office, and struck the outside wall of the depot, abutting on Central Street, with such force as to drive the bunter which had lodged on the cow catcher, clear through a solid granite rock a foot in thickness, making a hole about 15 inches in diameter. This put a stop to its progress in that direction, and as the floor was not strong enough to longer hold the weight, the whole mass broke through into the cellar, where it came to a standstill. A bystander had the presence of mind to make his way into the steaming mass of ruin and allow the steam to escape, and thus possibly prevent an explosion. The entire floor of the express office was broken away, and a large quantity of express matter destroyed. The only serious accident was that of an old lady of 70, who was in the express office at the time. She was so severely injured that she died in about two hours. It went about 100 feet after leaving the rails before coming to a standstill.

The principal blame is attached to the engineer for remaining on the main track when the other train was due, and also for leaving his engine after opening the throttle.

B.

Lowell, Mass., Oct. 10, 1883.

An Unsolicited Testimonial.

In the issue of the SCIENTIFIC AMERICAN of September 8, 1883, appeared an illustrated article describing a new motor for light work—the production of the Economic Motor Company, of this city. Under date of October 12, scarcely more than a month from the publication of the original article, the manager of the company sends the following:

"EDITOR SCIENTIFIC AMERICAN: DEAR SIR:

"It may be of interest alike to you and your readers to know that the notice published in your issue of September 8, regarding the new gas motor of this company, resulted in about 850 letters of inquiry from all parts of the United States and from Europe, besides innumerable personal applications."

Such an unsolicited letter it is perfectly legitimate to publish. If it means anything, it means that the SCIENTIFIC AMERICAN, with its enormous circulation at home and abroad, is an economic means for the introduction of new inventions and improved machinery to the public. It also implies that, as an advertising medium, it cannot be equaled.

Inventors and Inventions.

The New York *Sun* not long ago, in an article on some of the queer happenings in the world of discovery, said what is undisputably true, and that is, the number of successful inventors is always large, but the number of unsuccessful ones is very much larger. There is always somebody working at the insoluble problem of perpetual motion or making a flying machine. It not infrequently happens that, after a patent has been refused to an inventor, a subsequent application is granted by a different examiner.

It sometimes happens that a patent is granted to one man after somebody else has failed to receive a patent for the same invention. This is a fruitful source of litigation. Indeed, litigation about patent rights is so common that in the introduction of any valuable patent the legal expenses of defending it are a large part of the capital required. Immense sums were spent in defending Morse's patents for telegraphing, and the various patents for sewing machines, India rubber manufacture, and of the inventions that have revolutionized industrial processes. But, when rights are once established by law, the profits are enormous. It was shown in a recent case before the United States Court that for royalties alone on the manufacture of barbed fence wire more than $1,000,000 a year were paid.

Inventors are now chiefly busy with electricity, and the Patent Office is deluged with devices for making new uses of the modern marvel, or for using it with new appliances. Many of these inventions run in the direction of motors. The opinion has gained some ground lately that storage batteries of electricity are not as successful as was at first expected. It is asserted by some that no storage battery every gives out as much electricity as it receives, and that every moment decreases the amount yielded. Edison says the best storage battery is a ton of coal, which can be used at any time to drive a dynamo machine. Others, however, still think that the storage battery will produce wonderful results.

Inventors have always sought to utilize the forces of nature for the conservation of power. A good deal of time and money has been spent on efforts to utilize the force of the rise and fall of the tide. According to some plans, the water is to be stored in a reservoir at high tide, and used to turn a water wheel when the tide falls. Another plan is to get the power from the rise and fall of a float. There used to be a tidal mill at Astoria and another at Charleston, S. C. The large amount of land required to get the requisite area of water surface is considered an insuperable objection to tidal mills.

A good deal of money has been expended on solar engines, in the hope of getting power out the sun's rays. John Ericsson, the inventor of the Monitor and a thousand other things, has made some beautiful solar engines, and not long ago an inventor had a model of a solar engine on the top of the Cooper Union building, and managed to get up steam in a boiler. The trouble is, however, that the sun does not always shine, and the solar engine, to be of any practical use, must be accompanied with a storage reservoir of power that can be kept for a rainy day.

There is no telling of what great value the discovery of the simplest fact may be. When bromine was discovered by Ballard in 1824, nothing of importance was expected from it. Now it is a valuable factor in photography, and a useful remedy for nervous affections.

Capital is never wanted to try even the most foolish inventions. Not long ago an inventor had an idea that he could, by the use of a naked wire, produce a return current and avoid electrical disturbances in cables. He could have got the capital to lay a long cable under ground to try his experiment. He was with difficulty dissuaded from doing this by a practical man, who saved him lots of money by wrapping several miles of cable about a barrel and arranging the naked wire as proposed by the inventor. The result was a complete failure, but the cost of the experiment was comparatively trifling. This is an illustration of the large amount of money that can be wasted through ignorance. Men will work away at an idea with no knowledge of what has been done or what can be done, only to discover at the end what they should have known at the beginning.

A good deal of money has been spent in the effort to introduce ice machines. There is, however, a strong competition to be encountered, since ice may always be had for the gathering, and transportation is cheap.

Fire escapes are numbered by the thousand. Hardly a day passes that the Fire Commissioners are not compelled to test some new plan. A good deal of room is taken up in the Patent Office with the models of these contrivances.

A very good example of the eagerness with which capital can be secured to promote the most chimerical ideas may be seen in the story of the Keely motor. The stock holders have been pretty thoroughly bled already, but are compelled to bleed still more in the hope of saving what they have already expended. The varying fate of capital invested is seen in the contrasting results of the two steam heating companies in New York city, one of which has proved a most lamentable failure, while the other has had a measure of success. It is not so certain that money invested under ground will always return a fair interest. It may be necessary to incur great expense when an under ground cable gives out, as the whole route may have to be dug up to find the break.

Accidental discoveries have supplied some of the most valuable processes of the industrial arts. It is said that the rolling of cold iron was first suggested by the fact that a workman who was placing a piece of hot iron in the rolls carelessly permitted his tongs to be drawn in. He noticed that they were rolled, and not broken. He called the attention of the superintendent to the occurrence, and this led to investigation and experiment and the discovery that cold rolled iron is equal to steel for shafting purposes. The process of rolling iron cold was not long afterward patented, and millions of dollars have been made out of the patent.

There are many similar instances where observing workmen have called attention to valuable processes. A signal one was in the early period of the cotton manufacture, when a good deal of trouble was caused by the cotton sticking to the bobbins. All the workmen in the mill were delayed by the necessity of stopping work to clean the bobbins. At last one workman found a way to obviate the trouble. He, and he alone in all the mill, had clean bobbins. For a long time he kept his secret to himself. He finally revealed it on the promise of a pint of beer a day for life. His secret was to "chalk the bobbins." That little scraping of chalk on the bobbins saved millions of dollars a year, and the observing workman got not only his beer but a competence. Each extension of modern enterprise and skill brings with it a train of inventions. The railway, the telegraph, the steamboat, the development of iron, electricity, and petroleum, have each produced a long line of inventors more or less successful, so that each of these industries might have a creditable exhibition by itself.

Wrought Iron Struts.

At a recent meeting of the American Society of Civil Engineers in this city, a paper by Mr. James Christie, M. Am. Soc. C. E., on "Experiments on the Strength of Wrought Iron Struts" was read. These experiments were made at the Pencoyd Iron Works for the purpose of determining the comparative resistances to compression of long and short struts, rolled angles, tees, beams, and channel sections. The specimens were tested by four different methods, viz., with flat ends between parallel plates to which the specimen was in no way connected; with fixed ends or ends rigidly clamped to parallel plates, the plates substantially forming flanges to the specimen; with hinged ends, or both ends fitted to hemispherical balls and sockets or cylindrical pins; with round ends, or both ends fitted to balls resting on flat plates. The specimens varied in length from six inches up to 16 feet, and were selected to obtain a uniform character of material. The paper gives tabulated results of 299 experiments, and these results are illustrated by a number of diagrams. There were also results given of a number of tests of welded tubes. The general conclusions drawn from these experiments were as follows ($\frac{l}{r}$ being length divided by least radius of gyration):

When struts are short, say $\frac{l}{r}$ below 20, there will be no practical difference in the strength of the four classes, so long as reasonable care is taken to keep the center of pressure in the center of the strut. Hinged ended struts vary all the way from round ended up to flat ended in strength. If the hinges are pins of substantial diameter, well fitted, and exactly coincident with the axis of greatest resistance of the strut, the strength of the strut will be fully equal to that of a flat ended; but considering the impracticability of maintaining this rigid accuracy, the average hinged struts as compared with flat ended will fall in strength as the length is increased until $\frac{l}{r}$ is about 250, when they will average one-third less resistance than flat ended. From this point they will gain comparatively until $\frac{l}{r}$ becomes about 500, when both classes will be practically equal. Fixed ended struts gain in comparative resistance, from the shortest lengths upwards, until $\frac{l}{r}$ becomes about 500, when they are twice as strong as either the flat or hinged ended.

Round ended struts continually lose in comparative resistance as the length is increased. When $\frac{l}{r}$ is about 340, they will be half as strong as hinged ended, and when $\frac{l}{r}$ is about 160, they will have only half the strength of flat ended.

The iron from which the tests were made exhibited the following resistances to direct compression, being the general results of several tests of small section, fifteen inches long, and secured in such a manner as to prevent lateral flexure.

With 30,000 pounds pressure per square inch, incipient permanent reduction of length was observed.

With 35,000 pounds pressure per square inch, failure of elasticity occurred, and marked permanent reduction of length.

With 50,000 pounds per square inch, a permanent reduction of length of three per cent occurred.

With 75,000 pounds, a permanent reduction of ten per cent; and with 100,000 pounds pressure per square inch, a permanent reduction of twenty-eight per cent of the length.

AT Chester, Illinois, diggers in a clay bank unearthed, September 20, a number of fossilized remains, among which was the tusk of a mastodon, five feet six inches long, and at its root measuring eight inches in diameter. The skull was also found, but was too much decayed to be removed entire.

Ready Made Houses.

We have before referred to the large business carried on in some sections of the country by the manufacturing of ready made houses. A correspondent of the *Old Colony Memorial* paid a visit not long ago to Fairfield, Me., where a large establishment is located for the production of these knock down houses, and he says that few have any idea to what extent this business has been carried in Waterville and its neighborhood, or to what perfection it has been brought. In the establishment to which we refer dwelling houses are made, like boots and shoes, in any quantity, and of any size or style, and for any market in the wide world. Not long since this concern received a single order for fifty houses for Cape May, to be delivered speedily and in complete finish.

These houses were to be, not sheds nor shanties, but regularly ordered dwellings; and they were made accordingly and so delivered, and contain hundreds of occupants at this moment. An order will be received for a $50,000 hotel, or an ornate, French roof cottage, for a fine country estate, and these as easily and expeditiously furnished as an ordinary boarding house for a country village, or a barn for a ranch in Kansas or Colorado. Do not suppose that only a coarse, rough frame is thus sent out, to be trimmed into shape on the spot where it is delivered! On the contrary, the house is complete when it leaves the factory, and as ready to go together as is a musket when it leaves the armory at Springfield, all the parts being found, even to the knobs for the doors, and the screens and shades for the doors and windows, according to specifications. Great trains of freight cars stand waiting about, and are freighted almost daily here. The refuse trimmings and edge cuttings of the lumber are carted off to a neighboring pulp mill, and there speedily turned into material for paper or other products. Machinery for almost every conceivable use in connection with wood is at hand, and house materials, of any kind or size or shape, seem to drop out like meal from a hopper. In a recent instance, where a large building was furnished for a Southern order, the parts were thus made, and when put together in the city where the building is now standing the length of the latter was found to vary not the eighth of an inch from the original specifications, although its length on the front numbered hundreds of feet. Every inch of this building, from the sill to the last shingle, was sent ready prepared from this factory, and "set up" as readily and almost as quickly as a nail cask.

Alaskan Mummies.

Four Alaskan mummies were brought down from Alaska by the schooner Kodiak, on her last trip. Three go to Berlin and one to the Smithsonian Institution. The bodies are wonderfully preserved, even the skins in which they are wrapped being intact. One mummy, evidently that of a woman, is now in possession of the Alaska Fur Company, and is in a state of almost perfect preservation.

The mummies were secured by A. Jacobson, who has been over two years in the country collecting for the Royal Museum of Berlin. He is of the opinion that the mummies are at least 200 years old, all evidence obtainable pointing to that fact. The Esquimaux formerly preserved the bodies of their dead shammans, or medicine men, and those of their chiefs and their wives and their children, in this manner. After death the viscera were removed from the interior of the body through the pelvis, and the limbs being pressed close to the body, the legs well up under the chin, were dried and incased in skins, and then placed in some cave or rock shelter which was free from water or moisture. Here they remained for hundreds of years, and were reverenced by the living. To them were offered part of the results of their fishing and hunting excursions, if they were successful, for they judged success to be due to the spirits of those whose bodies were preserved. The mummies just brought down are in a wonderful state of preservation, considering the rude means employed. In the case of one that has been opened, the skin appears to remain intact, and the limbs are movable.—*San Francisco Bulletin.*

ON the New York, New Haven, and Hartford Railroad one of the tests exacted from candidates for passenger train brakemen is the ability to make a distinct announcement to passengers of the names of the several stations. On most of the railways it seems impossible for the average brakeman to speak plainly. Any sort of jabber that happens to come into his mouth he considers to be just as good as the mention of the real name of the station.

SCIENCE IN ANTIQUITY.—CURIO'S PIVOTED THEATERS.

Pliny states (lib. xxxvi., cap. 15) that toward the year 700 of the founding of Rome, that is to say, a half century before Christ, a very wealthy Roman citizen was desirous of giving, on the occasion of the funeral obsequies of his father, plays that should surpass all those that had been witnessed up to that time. This was a difficult thing to do, since, a short time before, Scaurus, the son-in-law of Scylla, and the possessor of a vast fortune derived from the effects of those who had been proscribed, had had constructed, while he was

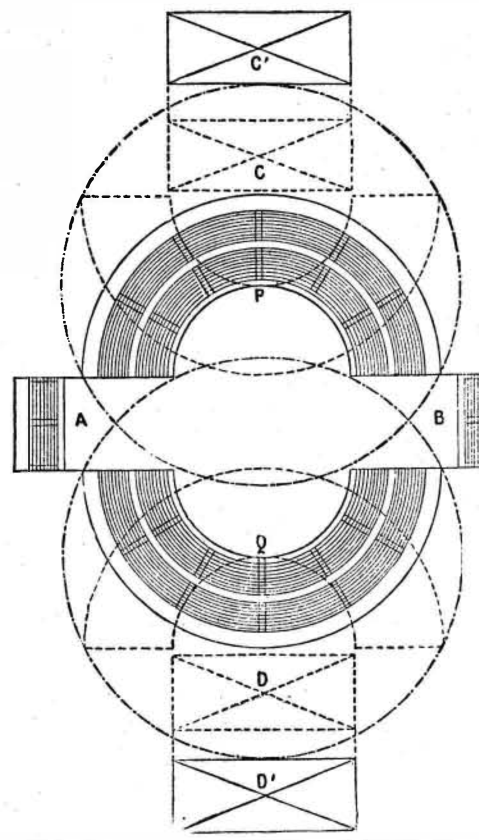

Fig. 2.—PLAN OF CURIO'S PIVOTED THEATER.

edile, a theater capable of holding 80,000 persons. The stage of this theater was ornamented with 360 columns, distributed in three superposed rows. Those of the lower row were of marble, and were 12 meters in height; those of the upper were of gilded wood, and those of the intermediate row were of glass. Between these various columns there were, in all, 3,000 statues.

Curio, not being able to hope to do anything more magnificent, says Pliny, was obliged to substitute ingenuity for extravagance. He therefore had constructed two very large wooden theaters quite near to one another, and each so exactly balanced upon a pivot that it could be revolved. In the morning plays were put upon the stages of each of these theaters, the latter then being placed back to back, so that the noise from one could not be heard in the other. In the afternoon, a few boards having been removed, the two theaters were all at once revolved so as to make them face each other, the magistrates and the Roman people being carried along with them. It was then only necessary to connect the corners of the two theaters in order to have an amphitheater in which gladiatorial combats might be exhibited. Which should be most admired here, the inventor or the thing invented? He who was bold enough to project the thing, or he who was rash enough to put it into execution? What is most astonishing is the foolhardiness of the Roman people, which was sufficiently great to allow them to seat themselves in so movable and unstable a machine. These people, the conquerers and masters of the entire world, who, after the example of the gods whose image they were, disposed of kingdoms and nations, were here suspended in a machine applauding the danger by which they were menaced.

On the last day Curio was obliged to change the order of his magnificent entertainments, since the pivots became strained and out of true. The amphitheater form was therefore preserved. Having placed the stages back to back across the whole diameter of the amphitheater, he exhibited combats between athletes, and then all at once removing the stages, he caused all those of his gladiators who had been crowned during the preceding days to appear in the arena.

The mode in which these theaters were constructed has occupied the attention of several learned persons. Cardan, in his book "De Subtilitate;" Barbaro, in his "Commentaire sur Vitruve;" and the Marquis Maffei, in his "Verona Illustrata," have had a few words to say about them; but the most plausible and the clearest explanation is the one given by Count Caylus in vol. xxiii. of the "Histoire de l'Académie des Inscriptions et Belles-Lettres" (1756).

I shall first observe here, with Count Caylus, that architects had still the habit at this epoch of building wooden theaters, since the first stone one was erected at Rome by Pompey; and then I shall recall the fact that Pliny wrote his history about one hundred and fifty years after the event, so that we need not accept anything but the principal data of his narrative, and may perhaps regard the circular voyage of the Roman people as a simple oratorical embellishment.

We know that such Roman theaters as were designed for the representation of tragedy or comedy, as well as for athletic spectacles, consisted essentially of three parts—the *cavea*, the *orchestra*, and the *stage*.

The *cavea* consisted of a series of seats raised above one another and forming concentric semicircles in which the spectators were seated. The upper tier, which was much the widest, formed a covered promenade. The *stage* was a parallelogram raised above the ground and placed against the diameter that limited the cavea.

Finally, the *orchestra* was the part which was situated on a level with the ground, and which extended between the stage and the cavea. It was here that the authorities were placed.

As for the amphitheaters that were designed for gladiatorial combats, these were formed of a series of oval tiers of seats inclosing the arena.

It will be seen that the transformation due to Curio's imagination might have been effected, as Pliny indicates, by a rotation, around the pivots, P and Q, of the two caveas whose framework rested upon a series a small wheels (Fig. 1) movable in circular tracks that were probably of metal like the wheels themselves. The stages, C and D (Fig. 2), of the two theaters, which were constructed of light framework, could be taken down and pushed back at C' and D', and allow the two theaters to revolve on their axes so as to come face to face, while leaving between them only the space necessary for the rotary motion. This space was then filled with light and movable pieces of framework, A and B, that formed on the ground floor vast doors for the entrance of the gladiators, and, in the story above, boxes for the Roman magistrates, who, whatever Pliny has said about it, must have been obliged to leave their orchestra stalls during the maneuver.—*La Nature.*

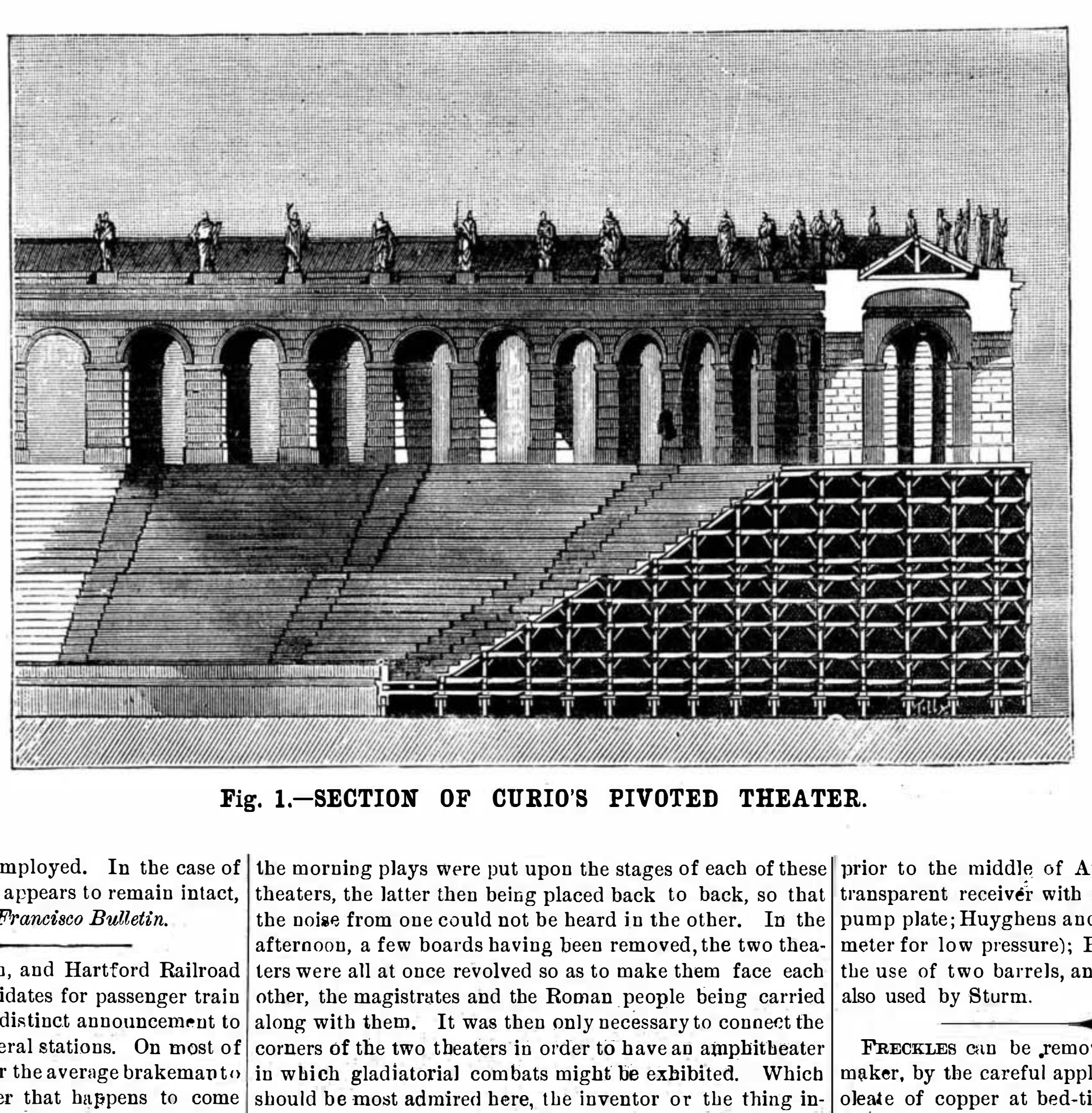

Fig. 1.—SECTION OF CURIO'S PIVOTED THEATER.

Early History of the Air Pump.

If it is difficult to decide who invented the telephone, one of the most recent inventions, how much more difficult it must be to ascertain the date of the discovery of the air pump more than two centuries ago. Gerlandt contributes a paper on this subject to Wiedermann's *Annalen*, in which he says that only this much can be established with certainty in regard to the date of its discovery, namely, that it was prior to the middle of August, 1652. Boyle invented the transparent receiver with movable cover; Huyghens, theair pump plate; Huyghens and Papin, the barometer test (manometer for low pressure); Papin, the doubly perforated cock, the use of two barrels, and the valves; but the latter were also used by Sturm.

FRECKLES can be removed, according to Dr. J. V. Shoemaker, by the careful application of a little ointment of the oleate of copper at bed-time. He makes the ointment by dissolving the oleate of copper in sufficient oleo palmitic acid to make a mass.