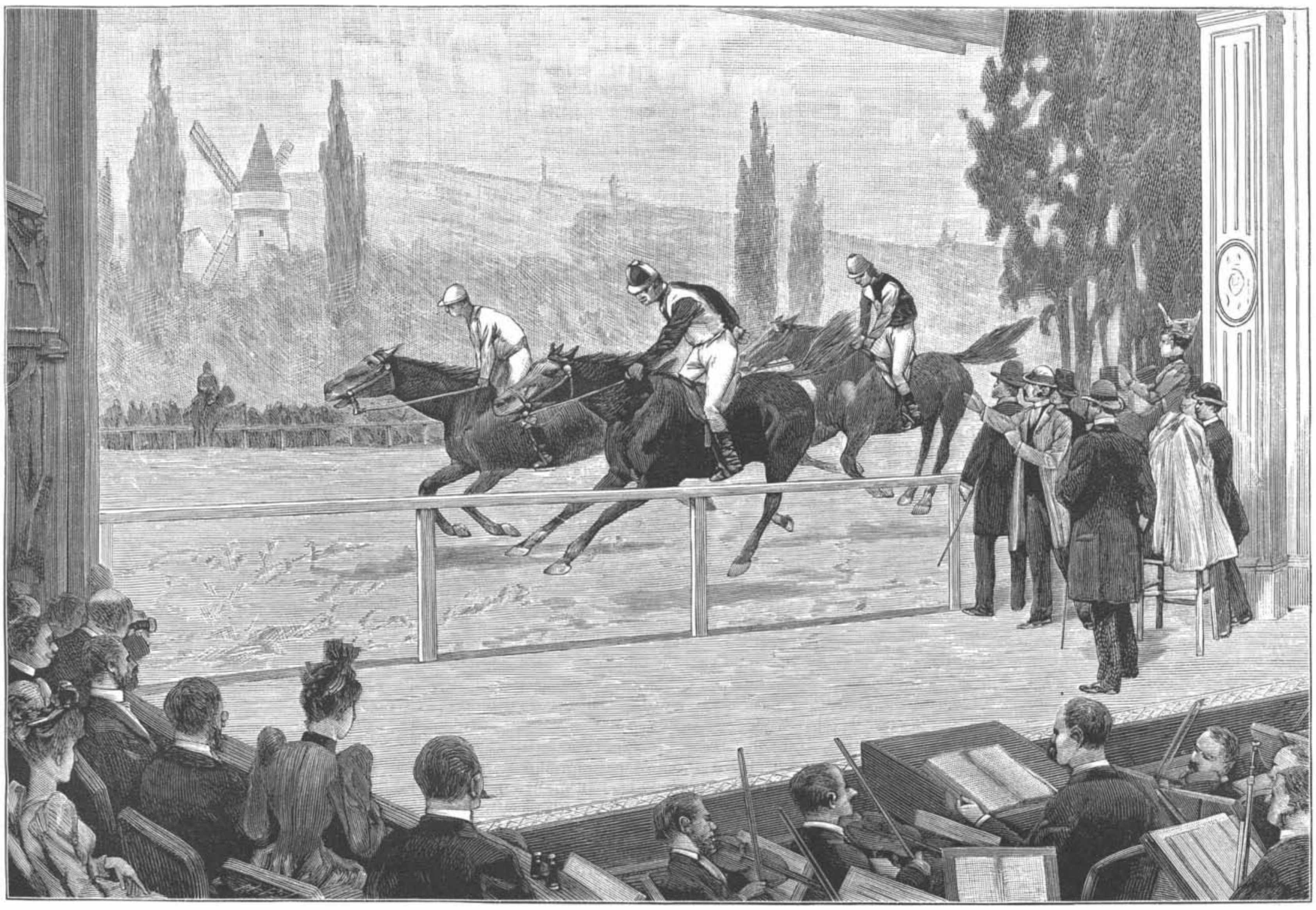
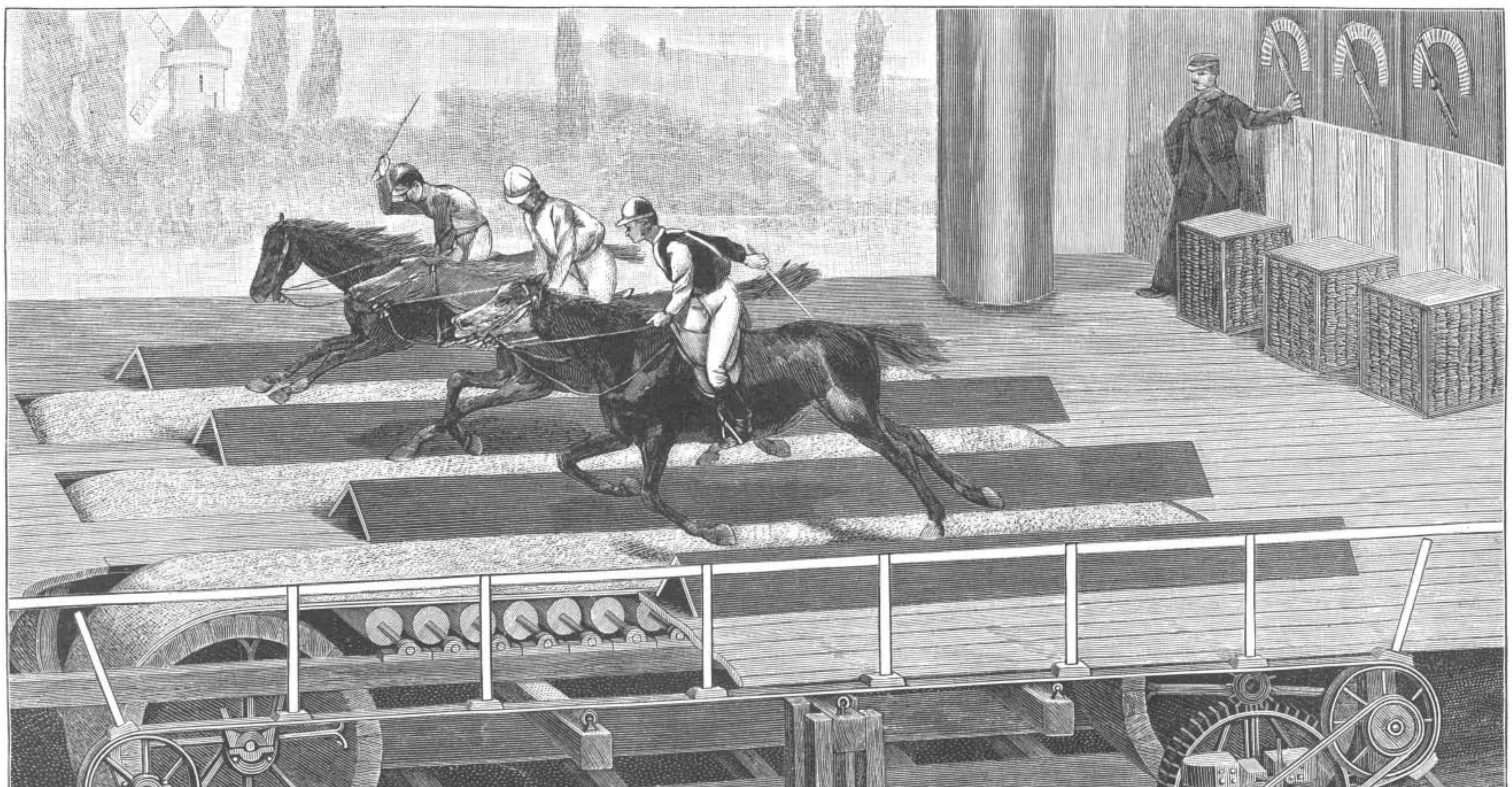
THE HORSE RACE ON THE STAGE.

One of the "hits" of Messrs. Montreal and Blondeau's "Paris Port de Mer," played at the Varieties Theater, is a horse race. Three genuine horses, ridden by three genuine jockeys, start off at full speed, and make the circuit of the hippodrome of Longchamps. We have here a real effect plus an effect of illusion. The horses are free from all restraint, and really gallop, but the ground disappears under their feet in moving in a direction opposite that of their running, and the landscape as well as the fences also fly in a direction contrary to the forward motion of the horses. Our readers have before their eyes the very simple arrangement by means of which this remarkable theatrical illusion is operated. The three horses run upon three tracks independent of each other, but arranged side by side. Our engraving represents, in section, one of these tracks, formed of an endless matting of cocoanut fiber analogous to the mats that serve for wiping the feet, but of thicker and closer texture. This belt, which is three feet in width, runs over two drums placed on each side of the stage, and is tautened by a third cylinder on a level with the stage floor. It is supported by a series of wooden rollers, which are placed very close together and revolve on pivots. The drum mounted to the left is capable of being set in rapid motion by an electromotor, which receives the current from a battery of accumulators placed on Feydeau Street, in the vicinity of the theater. The starting and the velocity of the machines are controlled through commutators maneuvered by handles.

At the moment of the race each horse appears upon one of the tracks. The electric current is sent into



RACING HORSES ON THE STAGE—EFFECT FROM THE AUDIENCE.



RACING HORSES ON THE STAGE—MACHINERY UNDER THE STAGE FOR DRIVING ENDLESS BELT.

the motors, and the belt begins to move. The horses, feeling the ground sliding and carrying them backward, first begin to move their feet in order to maintain their position; and then, on the one hand, the motion of the track becoming swifter, and, on the other, the jockeys exciting them with voice and spur, they begin a gallop which is so much the more marked in proportion as the motion of the belt under their feet is more rapid. Yet, despite the speed, the courses always occupy the center of the tableau circumscribed by the frame of the stage, and the background of which is formed of a panorama of Longchamps. The immobility of the horses in space results, then, from the double effect of their projection forward under the impulsion of the jockeys and of their carriage backward by the flight of the ground. If the belt should happen to come suddenly to a standstill, the horse and his jockey would be dashed against the wall; in the opposite case they would fall head over heels backward.

An equilibrium is maintained between the two impulsions by very careful attention to the commutators that regulate the running of the motors, and consequently that of the drums and belt. The illusion is completed by the unwinding of a canvas in the rear, 95 yards in length, representing the panorama of the country as seen from the stands of Longchamps. This canvas, which is first wound around a vertical cylinder on the right hand side of the theater, unwinds therefrom and afterward winds around a duplicate cylinder on the left hand side of the theater. The two cylinders are set in motion by a windlass maneuvered by manual power. Finally, the fence whose pickets are seen flying in the foreground, in the same direction as the panorama, is mounted upon an endless belt running around two drums actuated by a Popp air motor. The panorama unwinds in a minute and a quarter, and, during this time, the endless belt moves at a velocity of 3,200 feet per minute, or, in other words, at the rate of 12 or 15 leagues per hour. The authors of this truly curious illusion are Mr. L. Brader, who constructed the tracks, Mr. Solignac, who installed the electric motors, and Mr. Justin.

The apparatus used in this race is very similar to that used in the American play "County Fair," which has been running so long in this city. The effect is very real, and the interest of the spectators is kept up throughout the race. We believe that the idea was adapted from the American play. We are indebted to *L'Illustration* for the engraving and article.

Bleach and Caustic Soda from Salt.

The process by which bleaching powder and caustic soda is manufactured from common salt is quite simple, as well as economical. The salt is introduced into a still constructed of stone and provided with suitable tubes for heating, and a sufficient amount of nitric acid is added to transform it into nitrate of soda. Upon applying a gentle heat, the decomposition begins, and the nitrate of soda is rapidly formed. As the nitrate of soda is extremely soluble in a hot solution, the operation is so conducted that the solution of nitrate of soda in the still is saturated at the boiling temperature. The solution is then run out from the still and cooled. Owing to the great difference in the solubility of nitrate of soda in hot and cold solutions, a great mass of the salt is deposited on cooling. Over half of the quantity of nitrate of soda in solution at one hundred and ten degrees to one hundred and twenty degrees Centigrade is deposited on cooling the solution down to twenty degrees Centigrade. The crystals obtained by this cooling are separated from the mother liquor, which, together with more salt and nitric acid, is again sent to a still, and the operations repeated.

The gases resulting from the reaction in the still, composed principally of nitrosyl chloride and chlorine, pass into a vessel containing nitric acid and manganese dioxide in suspension, where nitrate of manganese is formed and chlorine is given off. The chlorine evolved passes through a washer, and then into a bleaching powder apparatus.

In this process all of the chlorine combined with the sodium in salt is obtained in the form of bleaching powder, and the gas passing to the bleaching powder chamber is pure chlorine gas, thus avoiding the weak and impure chlorine obtained in all magnesia processes, and avoiding the loss of two-thirds of the chlorine which is incurred in the Weldon process.

The crystals of nitrate of soda obtained by cooling the nitrate of soda solution coming from the still are mixed with two or three times their own weight of oxide of iron. The mixture is then heated to a red heat in a current of air in a cylindrical furnace. The nitrate of soda is completely decomposed and the gases evolved with an excess of air are passed over an oxidizing substance, such as manganese dioxide, a manganite, a manganate, or a permanganate of the alkalies or of the alkaline earths.

The nitrate of manganese liquor is heated and evaporated to a plastic consistency by the hot gases coming from decomposition of the nitrate of soda. The nitrous gases coming from the decomposition of nitrate of soda and nitrate of manganese finally pass, after treatment with air and steam, into the usual apparatus for condensation of nitric acid. Nitrate of manganese evaporated to the plastic condition mentioned contains about ninety per cent $MnO-2$. It will thus be seen that both the nitric acid and manganese are recovered. The mixture of iron oxide and soda is taken from the furnace and lixiviated. If the heat has not been carried too high, the mixture is in good condition for lixiviation. If lixiviated with hot water, a caustic liquor of thirty to forty degrees Baume may be obained practically free from carbonate of soda, so that when this liquor is evaporated and mad into caustic soda, an extremely high test of caustic soda may be obtained. —*Ameri an Paper Trade.*

How to Make a Blackboard.

Select seasoned pine lumber of the first quality and good width. Plane it well, joint nicely, and glue a sufficient number of boards together to make the required blackboard four feet in breadth. For end pieces use scantling which will dress two by three inches; saw them a few inches longer than the proposed width of the board; cut a slot through the pieces on the flat side, so as to admit the ends of the board, with an inch t spare at the top; into this spare space insert a key, and drive home. To hold the end pieces in position the board may be dovetailed at its lower edge. Form a chalk trough by nailing a strip of half inch stuff, five inches wide, to the lower edge of the board, and nailing to this strip, on its outer edge, a similar one two and one-half inches wide. Bevel or round off the inn r edges of the end pieces in a workmanlike manner, and smooth the surface of the board with fine sandpaper before painting. The board may be supported by leath r straps attached to the top. No nails or screws ar used, because they compel the forming of cracks whenever th re is shrinkage, by holding the several boards apart; by l aving the whole free to slide in the slot, and following up all shrinkage with a key, occasionally tightened, a perfect surface is secured.

DIRECTIONS AND RECIPES FOR PAINTING.

No paint in which there is oil should be used. Holbrook's, Sherwood's, "Alpha," and "Eureka" liquid slatings are first class paints. They come in pint, quart, and gallon cans, and are ready to use at any moment, and can be kept for years if tightly corked. One gallon will paint 250 square feet, and costs $6 to $8. Any school furnishing house will fill orders.

The following is taken from Wickersham's "School Economy:"

"T make one gallon of paint take 10 ounces pulverized pumice stone, six ounces pulverized rotten stone, three-quarters pound of lamp black, and mix with alcohol enough to make a thick paste. Grind the mixture thoroughly, and then dissolve 14 ounces of shellac in the remainder of the gallon of alcohol. Stir the whole together and th paint is ready for use."

The composition named below has been tried upon old boards and new with xcellent success. Dissolve gum shellac in alcohol, and mix with it lamp black and flour of emery. No more lamp black and flour of emery should be used than is necessary to give the required black and abrading surface, and sufficient gum to hold the materials together, and confine the composition to the board. The thinner the mixture, the better. The lamp black should first be ground with a small quantity of alcohol to free it from lumps. Apply with a common painter's brush, and when dry smooth with pumice stone.

A still cheaper preparation, though hardly as durable, may be made and applied by any school teacher before nine o'clock on a summer morning, and used in a half hour thereafter. For fifty square feet of board take four ounces of common glue, three ounces flour of emery, and just lamp black enough to give an inky color to the preparation. Dissolve the glue in three-quarters of a quart of warm water, put in the lamp black and em ry, and stir until there are no lumps, then apply t the board with a woolen rag smoothly roll d. Put on two or three coats, evenly, and you have a nice surface at a cost of about thirty cents for material. You may call this the "Poor District's Paint."

Caution. No pupil should be allowed to erase with his hand, or a wet eraser, from this or any other board.

Quoting again from Wickersham: A cheap and serviceable black surface may be made by the following recipe: Four pecks of white finish or white coating; four pecks of fine sharp sand, four pecks of ground plaster; four pounds of lamp black; four gallons of alcohol or good whisky. This quantity will make a mixture sufficient to cover twenty square yards. A little flour of emery will prevent the mixture from "setting" immediately, thus giving time to put it on the wall with the necessary are. If emery be not used, only a small quantity of the mixture can be put on at a time, and this is, perhaps, the better way.

The wall which is intended to be covered with the black surface should be plastered like the rest of the room, with the exception that the black mixture takes the place of the white coating, and is put on in the same manner. After the black surface is on the wall, it must be carefully dampened and rubbed in order to fill up the pores, and make the surface hard and smooth. If the old surface be well moistened, a new surface, composed of the same mixture, may be applied. It must be remembered that the black surface requires much more working with the smoothing trowel than the white finish.

PLASTER BLACK WALL.

Nearly or quite all black walls in this portion of the State, made within wooden buildings, have failed to stand. The mortar seems of poor quality, and the lath, constantly springing beneath the pressure of the hand while marking, causes the plastering to crack and fall in a very short time. To prevent this the room should be sheeted inside the studding, furred and lathed on that, and the first coat of plastering pressed in against the sheeting with great care. A very firm wall is thus secured. The black belt should be four feet wide, and come within two and one-half feet of the floor. It should surround the room. A chalk trough should extend its entire length, and it should be bounded at its upper edge by a simple moulding.

PAPER BLACK SURFACE.

When care has been taken to secure a good wall, strong manila paper, which is manufactured for the purpose, may be smoothly pasted on "hard finish," and then painted with liquid slating. It has proved durable in some instances, its durability depending, however, very largely on a smooth surface beneath.—*Minn. Teacher.*

Cradina.

In 1880, in a communication to the French Academy of Science, M. Bouchut reported that he had found the juice collected from the common fig tree (*Ficus carica*) to contain a powerful ferment capable of digesting albuminoid substances, thus confirming a belief of the ancients that the juice possesses digestive properties (*Pharm. Jour.* [3], xi., 250). This ferment is now the subject of a paper by Dr. Mussi, in which he reports its isolation and describes its properties (*L'Orosi*, Nov., p. 364). Juice collected from the fruit and branches of the fig was filtered to remove the serous portion from the insoluble, the latter repeatedly washed with water and the washings added to the filtrate. This liquid, which after repeated filtration was obtained limpid was distinctly acid in reaction, and when placed in contact with moist fibrin digested it completely. It was evaporated to a small volume, again filtered, and treated with absolute alcohol, which threw down a plentiful white precipitate that dried, when exposed to the air, to a dark yellow amorphous mass. This, when treated with water, swelled up and imparted a milky appearance to the liquid, but a clear filtrate from it, though it gave the reactions of vegetable albumen, had no digestive power. The residue, insoluble in water, dissolved readily upon the addition of a trace of acid or alkali, and the solution, placed in contact with moist fibrin, effected complete and true digestion. To the ferment thus isolated Dr. Mussi gives the name "cradina," from *krade*, the name given by the Greeks to the part of the fig with which they specially associated the digestive property. It contains nitrogen, and in the dry state it forms a friable, semi-transparent, dark yellow, amorphous mass, yielding an amber-yellow powder. In water it swells, but does not dissolv , though upon being shaken it imparts to the liquid a milky appearance. When dissolved by the aid of alkali or acid a concentrated solution is dark yellow, but becomes colorless upon being diluted. Cradina differs from pepsin in maintaining its digestive power in an alkaline liquor, and from papain or papayotin in being insoluble in water, not precipitated from solution by alcohol or lead acetate, and in its activity not being diminished in the presence of hydrochloric acid. In a neutral liquid it is devoid of digestive power and it has no reaction upon starch.—*Pharm. Journal.*

AT a recent meeting of the Engineers' Club of Philadelphia, Mr. Rudolph Hering continued reading a paper on the corrosion of iron and steel, and referred to galvanic action as a principal cause. He gave the results of experiments on this subject, and principally of those made by Mr. Thomas Andrews, of England. Wrought iron was placed in connection with numerous steels and cast iron, and exposed to sea water for about 300 days. From these it was found that metals corroded much faster wh n in galvanic connection than otherwise. The wrought iron (Wortley best scrap) resisted corrosion better than ith r steel or cast iron. The electro-chemical position of the steel changed frequently with reference to wrought iron, indicating that corr sion took place alternately in the wrought iron and steel. The position was almost constant, however, when connecting wrought and cast iron, indicating corrosion to take place almost entirely in the latter. Gravimetrical results were also given, which showed the amount of corrosion in grains per square f ot, per annum, under the conditions assumed in the xperiments.