

EXPLOSION OF AN UPRIGHT BOILER.

Our illustrations represent a boiler explosion which took place on the 23d of December, 1881, at the old Risley Pottery, in Norwich, Conn., resulting in fatal injuries to Mr. George L. Risley, the proprietor, a respected citizen of Norwich. The works are located on the west bank of the river Thames, and adjoining the line of the N. L. and N. R. R., from the freight yard of which the view of the rear of the property, Fig. 2, was taken.

Fig. 1 represents the arrangement of the boiler and engine before the explosion, viewed from the interior of the wing basement, showing the position of Mr. Risley as he was attending to his boiler about 10 o'clock in the forenoon; he having moved from the position shown in Fig. 1, toward the engine further to the background, as though to oil or to observe the motion of the engine, when the explosion took place, as shown in Fig. 3, by the blowing down of the lower tube plate of the boiler, whence the scalding water issued, blowing him into the rear of the boiler room; and though he was shockingly and fatally injured yet he was able to drag himself from under the ruins; but on attempting to rise, by pulling himself up at the window opening in the leaning side of the building, he was observed to fall back exhausted. He was removed to his home, and revived sufficiently to tell a tolerably coherent story of the condition of the boiler as to water supply, etc., but died soon after. No other person was in the neighborhood of the boiler at the moment, although a man who acted as assistant manager of the works and salesman of the wares had about two minutes before left the boiler room.

This explosion, which was observed by a number of persons, especially the flight of the boiler over the large tree, was a characteristic one for this type of boilers, which, it will be noticed, is about the most common form of American stationary boilers for small powers. But they usually

explode by collapse of the furnace sides. This boiler was three feet in diameter and seven feet high, made in 1867, as stated on a metallic card upon the front. The boiler was made of five-sixteenths plates, both shell and tube heads. It contained sixty tubes, two inches diameter, five feet long, which were set with a Prosser expander, and were beaded over as usual in this class of work. The upper tube head was flush with the top of the shell, and the lower one, forming the crown of the furnace, was about two feet above the grates and the base of the shell, and it was flanged upon the inner surface of the furnace walls. There was a safety plug in the lower tube head, which was not melted out, although, as is always the case when these plugs are so near the fire, a portion of the lower part of the fusible filling had disappeared. The boiler was provided with a brass safety valve, nominally one and a half inches, but the clear opening in its seating measures something more. The movable portion had no guide wings, but was kept in the axis of its housing by a long guide stem which passed upward through the high cap of its housing, and it was originally finished with a hemispherical end for the lever bearing; but the top had become bruised, and the lever had worn an irregular groove in which it rested, and thus as the valve rises from its seat the short arm of the lever is practically shortened by half the diameter of the stem, so that, after rising slightly, greater force would be required to sustain the weight

of the load on the lever's long arm than that which would barely balance it while the valve was on its seat. The short arm was one and a half inches long, but the lever and weight being lost the long arm and load on the valve could not be determined. There was a fine-looking steam gauge with an open dial which exposed the interior to view through the

glass, which was clean, bright, and uninjured; but this was in notable contrast with everything else about the boiler and its appendages. The gauge pipe had evidently been burst by freezing, and had been bandaged with rags to stop the leaks. It may have been frozen, and all commu-

as sheds, wagons, and the trunk of the tree lay undisturbed directly in the line from the boiler house to the place where the boiler landed, and was buried one half its diameter in the hard frozen ground, as shown in Fig. 4.

There had been numerous leaks in the tubes at their setting in the heads and through their sides, and an examination of Fig. 4 will show that four of them had been plugged by means of washer caps at each end of the tubes and a bolt through each of the four tubes. There was a crack in the upper head (Fig. 4) near the center which extended between three tubes. From this crack, which had been leaking for a long time, the steam escaped, and the water resulting from its condensation, mingled with the gases from the furnace, had settled upon the surrounding surface of the tube head and the tube ends. This is one of the most active corrosive mixtures to which boilers are exposed. The result upon the upper head and tube ends was to reduce the five-sixteenths plate to less than a quarter of an inch in thickness and to reduce the tube ends to the thickness of writing paper. The illustration shows the section of the full tube end and plate as new, and also the condition caused by the corrosive action of the acid vapors and water. This defective condition extended over about one-third of the upper head. The lower tube ends had suffered still more from leaks in their setting and from holes eaten in their sides till they were as thin as paper and afforded no adequate support to the head.

The pressure consequently forced the lower head down away from its tubes, opening fifty or more holes, two inches diameter, from which the fluid contents of the boiler issued at a high velocity, the water expanding into steamy foam, which, guided by the parallel sides of the fire box, formed an exit well adapted for a self-impelling projectile, and the whole boiler thus formed an immense rocket, weighing, when empty, about two thousand pounds. The way in which it landed shows that it

kept nearly its upright position in the air, the top inclining slightly forward, till it struck the ground as shown, with its furnace toward the buildings. This boiler was, with all others in Connecticut that are not inspected by boiler insurance companies, under the care of a set of State inspectors, who are distributed in Congressional districts, and whose business it is to give certificates annually to all boiler owners who have safe boilers and to forbid the use of such boilers as are not safe.

What had been done by the local State official, who, it is said, has been an engineer, but is now a farmer living in the same Congressional district, no one seemed to know; but it is evident he had neglected his duty to this boiler. On making inquiries at a neighboring manufactory, it was ascertained that the State inspector hires a man to do the work of inspection, and, being a boiler maker, he often finds a job, and probably the cost to the official is not very high, and he simply signs the papers. In the case of Mr. Risley's boiler, which has of late been used but little, perhaps the inspection and condemnation which should have followed had been neglected. The inspections consist in testing by hydrostatic pressure from the city water mains, which afford a pressure due to about 200 feet head. The pressure is allowed to rise in the boiler to fifty per centum above the working pressure, when the water is shut off, and the boiler is passed as safe for another year.

Leaks may exist and the boiler go on corroding, but the inspector's work as officially performed does not include search for defects which may result in disaster before the year expires; and so the mystery of boiler explosions goes unexplained, while the official says it was all the fault of the fireman, who has, poor man! paid the forfeit for his carelessness. There was no appearance of low

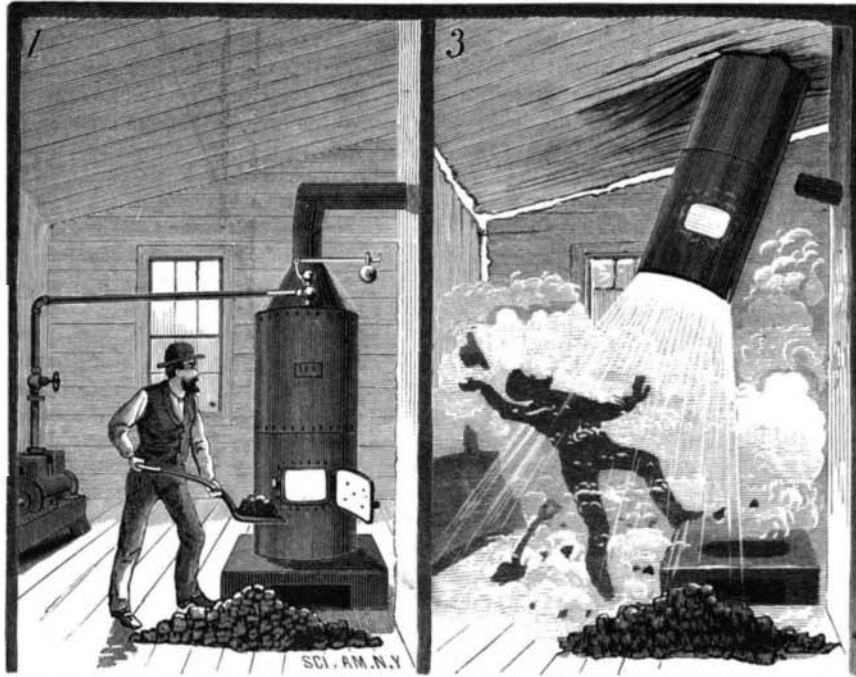


Fig. 1.—Boiler room before the explosion. Fig. 3.—The explosion.

EXPLOSION OF AN UPRIGHT BOILER.

nication with the steam room of the boiler cut off on the morning of the explosion; but this is hardly probable, because the pipe had been exposed to the warmth of the boiler room for three hours or more, or since 7 o'clock on that morning, when work is said to have commenced with the engine. Some wise persons said the gauge pipe was frozen, hence the explosion.

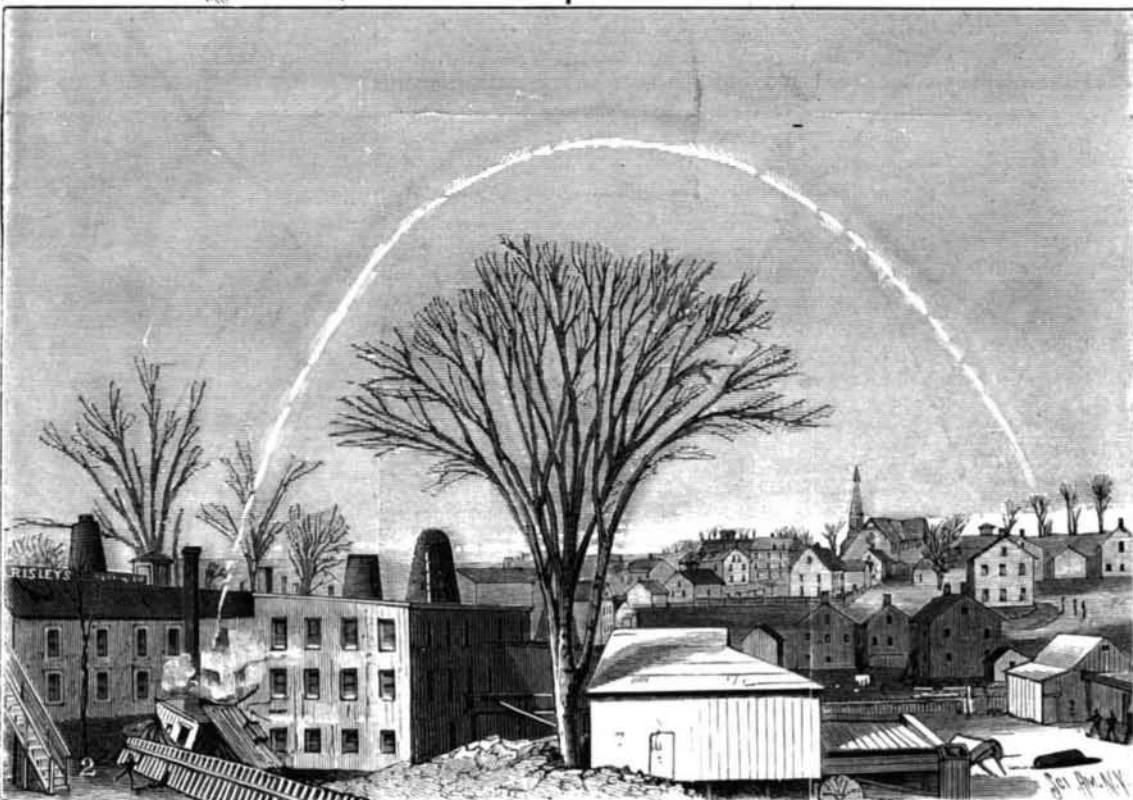
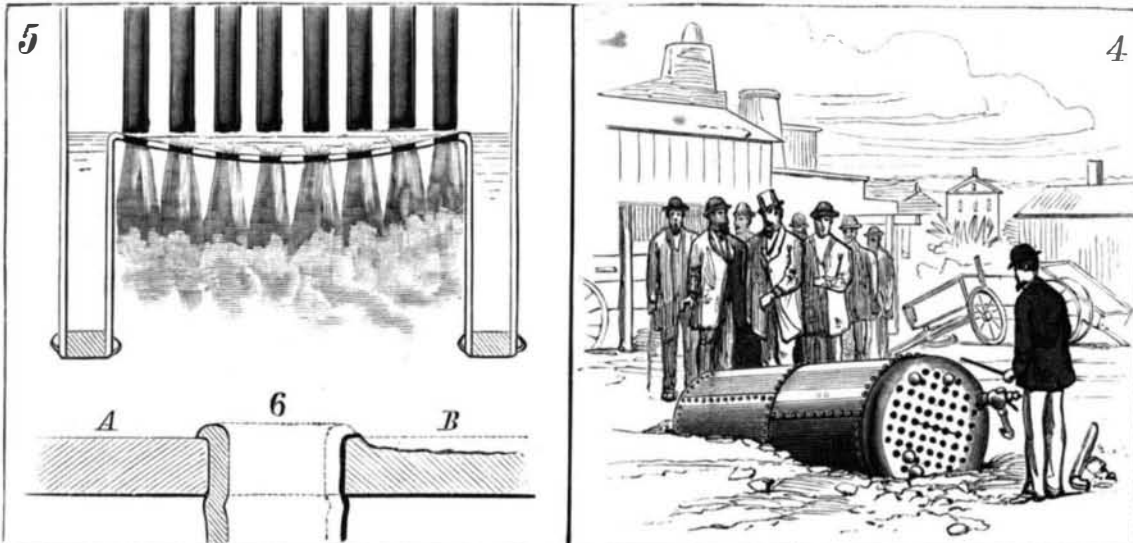


Fig. 2.—View of the Risley Pottery from the R. R. Freight Yard, and flight of the boiler. Fig. 4.—Boiler in the frozen ground after explosion, showing crack in upper head. Fig. 5.—Section of lower tube head and tube ends, showing the escaping water. Fig. 6.—A section of upper tube plate and tube end, B. The same corroded from leak, drawn full size.

EXPLOSION OF AN UPRIGHT BOILER.

The usual working pressure, as indicated by this steam gauge, was about sixty pounds per square inch, and, in the condition of the boiler, such a pressure with a boiler full of water would yield ample force to break open and send the boiler, as represented, over the top of the high tree, which it could not have passed in any other way than over its top,

the inspector's work as officially performed does not include search for defects which may result in disaster before the year expires; and so the mystery of boiler explosions goes unexplained, while the official says it was all the fault of the fireman, who has, poor man! paid the forfeit for his carelessness. There was no appearance of low

water or overheated iron here, although the SCIENTIFIC AMERICAN representative was told that the boiler was red hot when it struck the ground 120 feet away. The appearance of the fusible plug, with its filling still in it, did not seem to confirm this evidence of an eyewitness.

This boiler was fed with cold water directly from the city pipes, and near where it entered the boiler there was evidence, in the shape of leaks and patches on the furnace sheet, that it had suffered severely from this practice.

EARTH CONNECTIONS FOR TELEGRAPH WIRES AND LIGHTNING RODS.

When the return current in a telephone or telegraph circuit is carried through the earth it is, of course, necessary to make a very perfect connection between the line and the earth. When it is inconvenient or impossible to make use of water or gas pipes this is accomplished by the use of large plates of copper buried in the earth. Such plates are expensive, and they soon become oxidized so as to be almost insulated. The latter condition takes place still sooner with iron rods or plates.

In the use of strong constant currents, as for ringing bells on railways, etc., disturbances that are attributed to faults in the machinery or the batteries are frequently caused by imperfect earth connections. According to the *Electrotechnische Zeitung*, Gruener makes use of coke for grounding the current, as well as for the lower end of lightning rods. It possesses the advantage of durability and is comparatively cheap.

A massive block of fine grained coke has a hole bored in it a foot deep, and about 2½ inches in diameter. In it are placed some pieces of pure beeswax, which are melted by means of a blowpipe and alcohol lamp. This is continued until the wax is no longer absorbed into the pores in the walls of the hole. Then the copper wire, one-eighth inch in diameter, which is to serve as line closer, is inserted in the hole. It is made like a clasp at the end and bent upward and then downward. It is now heated by the blowpipe until the wax in the hole is boiling hot, and then carefully driven in until it touches the bottom of the hole. The vacant space around the wire is filled next with lead. Finally the upper edge of the hole receives a coating of hot wax, and over it a second one of tar or asphalt. The durability of the earth connection depends upon carrying out the above details carefully and accurately.

In laying the earth conductor the piece of coke that has been united with the copper wire, as before described, is buried in a hole about forty inches long and of the same width. Its depth will depend upon the amount of moisture in the earth at that place. It is embedded in fine earth, and a piece of lead pipe or tubing about one-eighth or one-quarter inch in diameter is slipped over the wire, its lower end in contact with the piece of coke, and long enough to reach to the surface of the ground. At the upper end a piece of larger pipe, about one or two inches in diameter and three inches long, is put over it, and filled with pitch or asphalt to prevent moisture from penetrating. About twenty-five or thirty pounds of coke, in pieces, is thrown in the hole around the big coke block and packed against it. Over this comes fine earth, on which water is thrown so it will fill up the spaces between the coke and adhere to it. The hole is finally filled with any kind of dirt or earth that has been taken out of it. At the upper end, too, the lead tube and wire is bent downward to prevent the water from entering it. It has been found that such earth connections do good service even in coarse material and tailings without the addition of fine earth.

P. N.

PORTABLE COMBINED BATH TUB AND HEATER.

The engraving shows a portable bath tub, with an attached water reservoir and heating chamber, the reservoir and heating chamber having sufficient capacity to contain water enough to supply the bath tub with the amount of water ordinarily required for bathing purposes.

The water tank or reservoir is located at one end of the bath tub and elevated above it, so that the entire capacity of the tub is available to the bather, and so that the water contained in the tank, when heated to the desired temperature, can be admitted to the tub through an ordinary stop cock. The heating chamber adjoins the water tank, and is composed of inner and outer walls or casings, closed at top and bottom, forming a water chamber, and communicating with the tank through top and bottom ports or passages.

The central space formed by the inner walls of the heating chamber serves as a flue or chimney for the passage of heat from the lamp. This invention was lately patented by Mr. William Q. Prewitt, of Lexington, Ky.

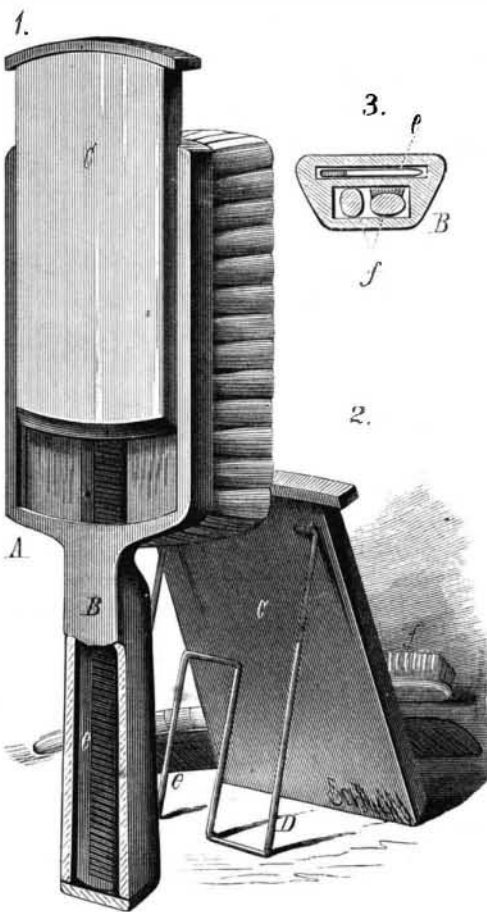
The Largest Bell in England.

The long-promised big bell for St. Paul's Cathedral, in London, has been cast. Twenty-one tons of metal were used in the operation, and from three furnaces liquid streams were pouring for four and three-quarters minutes before the huge hole in the sand was filled. When dug out, the bell weighed 17½ tons, which makes it the largest bell in England and one of the largest in Europe. Following are the weights of other famous bells: The first big bell at Westminster, 15 tons 8 cwt.; the second 2 tons lighter; Great

Peter, at York Minster, 10¾ tons; Great Tom of Lincoln, 5½ tons; the previous big bell of St. Paul's, 5½ tons; that at Olmutz, 17 tons 18 cwt.; Vienna, 17 tons 14 cwt.; Erfurt, 13 tons 15 cwt.; Sens, 13 tons; Paris, 12 tons. It will not be possible to take the new bell to London by rail; it must go by horse road.

NEW TOILET COMBINATION.

The engraving shows a novel toilet article combining hair brush, tooth brush, mirror, and receptacle for various toilet articles. The brush, A, is chambered and provided with a hollow handle, B, for receiving a tooth brush, f, and comb, e. The cavity in the back of the brush is closed by a sliding cover, C, consisting of a mirror with beveled edges. This mirror has a wire brace, D, which folds closely against



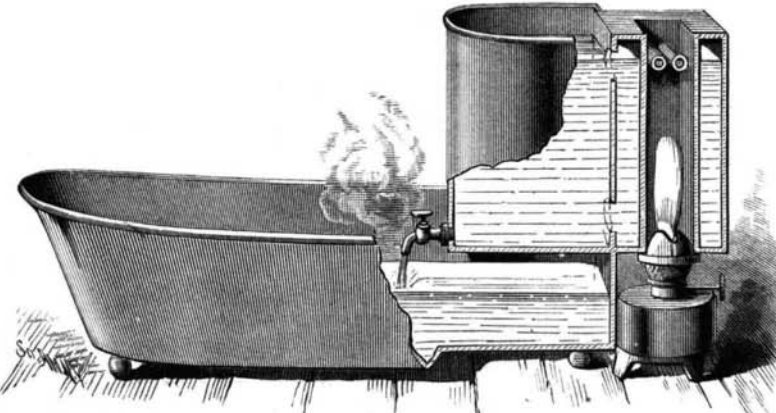
NOVEL TOILET ARTICLE.

it and is capable of being used to support it as shown in Fig. 2. Besides holding the comb and tooth brush the brush handle and back is capable of holding various other toilet articles, such as pins, hair pins, button hook, glove buttoner, etc.

This invention was recently patented by Messrs. I. N. Arment and A. E. Scott, of Dayton, Washington Territory.

Metallic Eliminations by Milk.

Dr. Lewald has, says the *Lyon Medicale*, investigated the elimination, by the milk of the mother, of iron, bismuth, iodine and its compounds, arsenic, lead, zinc, antimony, mercury—also alcohol, and several narcotics. His numerous experiments were made with the goat; a certain dose of the medicine was administered to the animal, after which the



PREWITT'S COMBINED BATH TUB AND HEATER.

milk was examined—some of the results being as follows: A larger quantity of iron can be administered to the infant through the mother's milk than by any other means; bismuth, likewise, is eliminated by the milk, but in very small quantity; iodine does not appear in the milk until ninety-six hours after taking it, and the iodine of potassium, given in doses of forty grains daily, appears four hours after digestion, and continues to be eliminated for eleven days; arsenic appears in the milk at the end of seventeen hours, and its elimination had not ceased after sixty hours; though one of the most insoluble preparations, the oxide of zinc, is nevertheless eliminated by the milk, and it is probable that this is also the case with the other preparations of zinc.

MISCELLANEOUS INVENTIONS.

An improved straightway valve, which is free from serious defects common to the straightway valves heretofore in use, has been patented by Mr. Thomas J. Loftus, of Sacramento, Cal. In this improvement the valve casing is made with two ports, one at each end, and with a projection at each side, and contains two sliding gates having conical recesses in their inner or adjoining sides. These recesses contain a conical wedge which is swiveled to the lower end of the screw valve stem that has an annular flange which is also contained in the recesses and is overlapped by shoulders at the upper ends of the gates. The gates are lowered by the valve stem until they rest on the projections of the casing, and are then spread and pressed against the ends of the casing by the swiveled conical wedge, so that they will close the ports tightly. These gates cannot grind on the inner surfaces of the ends of the casing, as their movement is purely a lateral one when closing the ports, and replacing the outer surfaces will not cause them to drop any lower than before, as it does in other straightway valves.

Mr. Marion A. Wycough, of Batesville, Ark., has patented a case for holding and preserving documents. It consists in an oblong box having one of its sides pivoted in such a manner that an internal spring shall press the free end of the pivoted side against the contents of the box, to hold them securely in place while the box is being withdrawn or returned to its cell.

An improved alcohol cock has been patented by Mr. Clarence C. Mulford, of Streator, Ill. The object of this invention is to provide an improved spirit cock to be used in opening or thawing out gas service pipes which have been closed by the action of the frost, the improvement being adapted to perform such operation quickly and thoroughly without waste of the spirits used or escape of gas from the pipes; the invention also provides safe means for testing the condition of the pipes during the thawing operation.

An improved car seat, which can be converted into a double sleeping berth very rapidly and conveniently, has been patented by Mr. George Merz, Jr., of Denver, Col. The invention consists in a car seat having a board of half the width of the distance from one seat to the opposite seat, pivoted to the front and rear edge. These boards can be held in a raised position to form an extension of the seat by means of a curved rack brace or other pivoted brace, and the back of the seat having a board pivoted to its upper and lower edge, which boards fold on the inner or outer surface of the seat back and have folding braces pivoted to their ends, which braces are adapted to extend nearly to the outer or longitudinal edge of the boards, so that when the back is raised above the seat and the pivoted boards are raised to form extensions of the raised back, all the several parts are strongly supported and held in position by the folding braces of the pivoted boards, the lower ends of these braces fitting into notches in the arm rests of the car seat.

An improved window cushion, which is used as such when raised, and ornaments the space below the window on the inner side of the wall when lowered, has been patented by Mr. John C. Lackner, of New York city.

An improved end board for wagons has been patented by Mr. Jeremiah Park, of Montandon, Pa. The invention consists in an attachment or box provided with inclined sides of the same height as the wagon body, and having a slide in its inclined bottom, which attachment can be secured to or removed from either end of the body, as desired, whereby the capacity of the wagon body is increased without increasing its height, and commodities—such as corn, fruit, vegetables, etc.—can more quickly be unloaded from the wagon by moving out the slide and letting the commodity fall through.

An improvement in apparatus for chroming fabrics has been patented by Mr. Victor M. C. Lallemand, of Chester, Pa. In apparatus, as heretofore constructed, for chroming fabrics or raising plain black or other plain shades of color that need to be chromed after padding and drying, the pieces are washed by the bath and soiled by passing through the dirtied solution, so that the last pieces of a run are of a poor shade, and the liquor by that time becomes worthless. The bath, too, necessarily being a capacious one to obtain good results, the quantity of bichromate of potash and sal soda required for the solution has been very large. The object of the invention under notice is to avoid these difficulties. In it the goods are passed down at the front of and beneath a roll in a chroming box which is of the smallest size possible consistent with the space necessary for the required quantity of liquid. From said roll the goods are passed up to and between squeezing rolls, and from there given a protracted travel over rollers in a steam chest, and then conducted through a water box and afterwards through a second pair of squeezing rolls to a delivery roller. By this apparatus the fabric first comes in contact with the solution comparatively pure in front of the roll in the chroming box, and passes only once through the liquor, so that no coloring matter will be lost and uniformity of shade is preserved. The only waste of solution is at the completion of the work, and there is a large saving of material.

An improvement in the swinging tops of children's carriages, whereby they may be locked either in vertical position or inclined backward, has been patented by Mr. Charles M. Hubbard, of Columbus, O.