New Car Signal.

The Providence & Worcester Railroad has been supplying its cars with an apparatus enabling the conductor to signal to the engineer by blowing the whistle from any portion of the train. The appliance is described as being somewhat similar to the automatic air-brake, and consists of a pipe running underneath the cars, with couplings at either end. Attached to the pipe at one end of each car is a smaller pipe running to the top and across to the center, where a valve is fixed. Over this valve is the hole for the signal rope, which is attached to the valve. When the conductor wishes to signal he pulls the rope, which runs through the car, the same as he formerly pulled the bell rope. This opens the valve, the air escapes, and the whistle is sounded by the release of the air from the pipes. The advantage of the new arrangement is readily apparent. With a long train the conductor was formerly obliged to give a long pull at the bell rope, ofttimes bringing it half way to the floor of the car, and even then was not sure that the bell rang, or that it responded to his signal as he wished it to do, while, as a matter of fact, it often did not respond. Now he has only to pull a rope the length of the car at most, and can readily tell whether or not the valve responds, knowing that if it does the whistle is giving the desired signal to the engineer. In case one of the cars in the train is not provided with this new arrangement, the bell-rope is hitched as usual, and if the conductor wishes to signal from that car it is simply necessary to pull the rope, thus opening the valve in the next car. A number of the cars of the above road are said to have been fitted with the new arrangement, which, it is understood, will be applied to all.

NEW POTATO DIGGER.

We give an engraving of an improved potato digger recently patented by Mr. Charles W. Dutcher, of St. Andrews, New Brunswick, Canada. This machine is provided with a share attached by hinged connection to the main frame, and capable of being elevated or depressed by means of a lever near the driver's seat. The share is ribbed longitudinally in the middle to thoroughly break up the hills of potatoes, and is provided with a slotted rear extension, over which the potatoes are crowded on their way to a shaker pivoted at the rear of the share and capable of lateral motion.

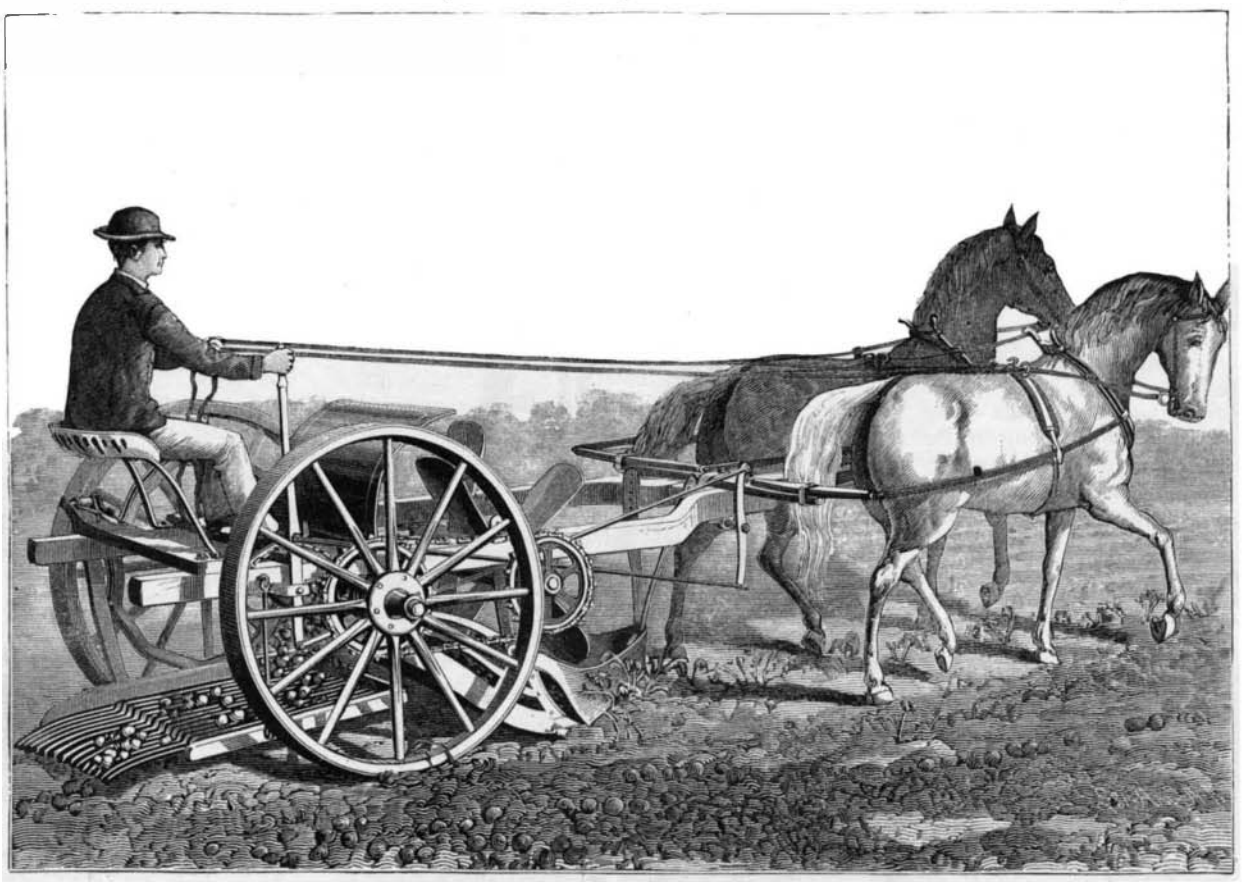
Above the share there is a scraper for clearing the ground of weeds, potato tops, stones, etc., to prevent them from entering the separating devices and becoming mixed with the potatoes; above the share there is a paddle wheel driven by a chain from a sprocket wheel on one of the drive wheels. This paddle wheel pushes the earth and potatoes backward to the separating bars. The separator shaker consists of a number of bars bent at their rear ends toward the right hand side of the machine, and having a downward offset to facilitate the discharge of potatoes. The left hand side of the shaker is provided with a rim that prevents the potatoes from being discharged on that side, and so insures a clear track for the horses and machine on the next round.

The shaker receives its motion from a zigzag cam carried by one of the drive wheels, and its motion is more rapid toward the discharge side of the machine than it is toward the opposite side, the object being to insure a uniform and proper deposit of the potatoes after they are raised from the ground and cleaned.

The raising and lowering of the main frame together with the share is effected by turning the tongue in its socket by means of the hand lever before described, and by the same means the share is raised sufficiently high to clear the ground when it is desired to transport the machine from one field to another.

Another lever is provided for throwing the sprocket wheel that operates the paddle wheel in and out of gear.

A guard consisting of a curved plate of iron is placed at the rear of the paddle wheel to protect the face of the driver from earth that might otherwise be thrown in his face. This machine is simple in its construction, rapid in its operation, and deposits the potatoes in a clean row on the surface of the ground, so that they may be readily picked up and placed in the baskets.



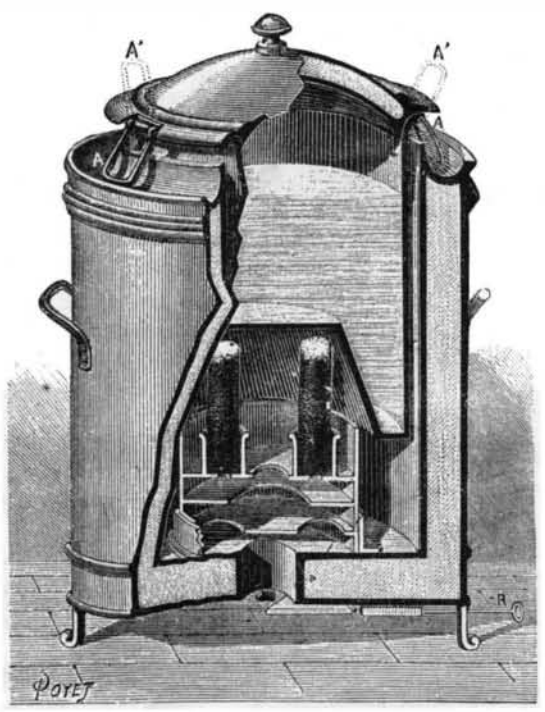
DUTCHER'S POTATO DIGGER.

THE Hudson River Power and Paper Company have completed a new dam across the Hudson River at Mechanicsville, N.Y. It is 1,000 feet long, 16 feet high, 18 feet wide at base and 8 feet at top, with its canal it has cost $200,000. It will furnish 4,000 horse power.

LABORATORY APPARATUS FOR HEATING WATER.

The accompanying cut represents a very useful little apparatus for laboratories that are unprovided with gas, and in which the heating of water by alcohol would cost too much. It is called the "American" kettle, and is heated very cheaply with an asbestos carbon. The laws of thermics are applied in this apparatus very intelligently.

The furnace consists of a double jacket, filled in with materials that are poor conductors of heat. Above the aperture in the bottom for admitting air there is a small sheet iron fire-pan, having a double bottom pierced with alternating holes, so as to prevent the ashes from falling outside, and to heat the air of combustion better. In this fire-pan there



APPARATUS FOR HEATING WATER.

are fixed one, two, or several asbestos carbons, according to the number of holders. The boiler, the bottom of which is concave, descends on the fire-pan in such a way as to allow the escape of none of the heat that acts within the hollow part. A very thin annular space suffices for the draught. With two carbons, of 100 x 70 x 25 millimeters, three liters of water may be caused to boil in thirty minutes at an expense of ten centimes; and the heat may be kept up seven or eight hours on lowering the kettle and closing the lower register, *r*. The handles, A, of the kettle are calculated to give just the draught necessary when, on being turned down (as in the cut), they raise the apparatus on its furnace.—*La Nature.*

GLASS SHINGLES.—The *Brick, Tile, and Metal Review* reports a new use of glass for shingles. It is claimed that glass roofing is at once better, more durable and cheaper than slate. The glass is usually opaque, but may be translucent or clear as desired. The exposed parts of the shingles are corrugated. The shingles lap at the sides, are closely interlocked, and one rivet suffices for a pair of shingles. It takes but 150 of these shingles 8 by 12 inches to cover a square of 100 square feet, the waste is so small; whereas of slates of the same size 300 are required.

New Journal Bearing.

A recent improvement in linings for journal boxes, for car axles, and other purposes, of which Mr. Ferdinand E. Canda, of 52 William street, New York, is the author, consists in taking advantage of the well-known unguentous or anti-friction qualities of mercury. He makes an amalgam of tin in which any of the well-known metals or alloys used for bearings are employed as constituents with mercury.

While the mass is in a plastic state it is subjected to pressure to expel the superfluous quicksilver, and then allowed to harden; the journal box is then ready for use. Plumbago or other suitable anti-friction substances may also be introduced into the amalgam if desired. It has been found by experiment that this new journal box metal has superior qualities as an anti-friction substance, and it promises to form an economical, durable, and most useful material for railway axles, and bearings of every description.

Meteors.

In a letter to a friend in Boston, an officer of the United States steamer Alaska gives an account of a meteor which was seen from the ship on the evening of December 12, 1882, a few minutes after sunset in latitude 38° 21', longitude 134° 7'. All at once a loud, rushing noise was heard, like that of a large rocket descending from the heavens with immense force and velocity. It proved to be a meteor, and when within ten degrees of the horizon, it exploded with much noise and flame, the fragments streaming down into the ocean like great sparks and sprays of fire. The most wonderful part of the phenomenon then followed, for at the point in the heavens where the meteor burst there appeared a figure shaped like an immense distaff. all aglow with a bluish light of intense brilliancy. It kept that form for perhaps two minutes, when it began to lengthen upward, and growing wavy and zigzag in outline, diminished in breadth until it became a fine, faint spiral line, at its upper end dissolving into gathering clouds. It remained for about ten minutes, when it began to fade, and finally disappeared.

The captain of the Bark Gemsbok, arrived at this port from Auckland, December 27, reported that on October 9, during a southwest gale and thick snow squall, a ball of fire passed across the ship, injuring three seamen and breaking both gunwales, and ripping the planks from the stern of the starboard boat, and exploded about twenty yards from the ship with a loud report, sparks flying from it like rockets. There was no lightning or thunder at the time.

A large and brilliant meteor was seen at Concord, N. H., on the afternoon of December 20, between four and five o'clock. It passed across the northern sky from west to east, and was as plainly visible as meteors usually are after dark.

Improvements in Letter Copying.

The process utilizes the well-known glue plate, consisting of glue, water, and glycerine, but with rather more glue than in the hektograph. For writing, a strong alum solution is used, colored slightly with an aniline color to render it visible. The glue plate is moistened with a sponge, and after a few minutes the written paper to be copied is laid down upon it; in taking it off after a minute or two, the characters are seen to be etched or engraved in the glue. By means of a caoutchouc roller a little printer's ink is spread over the plate. Impressions may then be taken off on slightly damp paper. The ink roller requires to be passed over previous to each impression being taken. Herm O. Lehn, of Charlottenburg, has also recently patented an improved copying apparatus, in which a specially prepared moistened paper is stretched in a frame, the original writing is placed upon it, and left for one to two minutes; after removing it again, the negative or prepared paper is spread over with ink, and the copies are taken. The following process is patented by Komaromy in Buda-Pesth: The following mixture is painted over paper impervious to water—1 part gelatine, 5 glycerine, 0·2 Chinese gelatine, and 1 water. The manuscript is written with the following solution—100 parts water, 10 chrome alum, $5H_2SO_4$, 10 gum arabic, and then laid on the first paper. An aniline color solution is now poured over it, and the excess removed with silk paper. Those parts which have been touched by the prepared ink become hard and incapable of taking up the aniline color solution, and the remainder becomes deeply colored. By placing clean paper over it, negative impressions are obtained.

The Early History of Photography and the Daguerreotype Process.

A.D. 1556. The alchemists noticed that horn silver (fused silver chloride) blackened when exposed to the sun's rays.

1777. Scheele, the great Swedish chemist, discovered that silver chloride is very readily darkened by blue light, and very little or not at all by red light (origin of the employment of red glass in our dark rooms). He also proved that when this darkening occurs chlorine is liberated, and that the darkened salt acted upon by ammonia leaves a residue of metallic silver.

1801. Ritter extended Scheele's experiments. He found that silver chloride darkens in the space beyond the violet end of the spectrum, demonstrating the existence of rays which do not excite vision. These are now called the "ultra-violet rays." Ritter also observed that the red (least refrangible) rays not only do not darken silver chloride, but that they actually whiten silver chloride that has been darkened in the blue (more refrangible) rays.

1802. Wedgwood, the great potter, and Sir Humphry Davy coated paper and leather with silver nitrate and silver chloride, and obtained profiles by the agency of light. They, however, could not fix the pictures thus produced.

1827. Niepce came to England, and brought specimens of pictures taken in the camera. He discovered the property of light of rendering various resins insoluble in their solvents.

1839. The daguerreotype process was published in this year, and Mr. H. Fox Talbot communicated his paper process to the Royal Society, and first produced negatives. Mungo Ponton also this year discovered that potassium bichromate when on paper altered in composition by exposure to light.

1840. The Rev. J. B. Reade accidentally observed the development of the latent image in the Talbotype process with gallic acid.

1841. The calotype process introduced by Fox Talbot (description postponed).

1843. Sir John Herschel first took pictures on glass, and recommended the use of hyposulphite of soda for fixing.

1851. Mr. Scott Archer and Dr. Diamond introduced the collodion process in a practical form.

THE DAGUERREOTYPE PROCESS.

A silvered copper plate is polished with tripoli and rouge and chamois leather buffs until the surface is quite free from scratches, when it is exposed to the fumes of iodine for about three minutes, or until the surface presents a bright yellow color, and then to bromine until it assumes a violet hue, when it is ready for exposure. After exposure no image is visible, but on placing the plate above mercury heated to about 150° Fahr., it rapidly appears, the lights being represented by an amalgam of mercury and silver, and the shadows by silver. It is fixed by immersion in a ten per cent solution of hyposulphite of soda. After washing, the image may be intensified by pouring on the plate mixed solutions (very dilute) of gold chloride and hypo., and heating over a spirit lamp. The picture should be protected with a glass plate.

Theory of the process.—The iodine (and bromine) attacks the silver, forming a thin film of silver iodide, Ag I. On exposure to light this is reduced to subiodide—

$$2\,Ag\,I = Ag_2\,I + I.$$

The silver underneath the film acts as a sensitizer, combining with the iodine set free to form fresh iodide. On development, the nascent atoms of silver in the subiodide form an amalgam with the mercury.—*E. Howard Farmer, in British Journal of Photography.*

Healthy and Profitable.

Some industrious Gothamite, bent upon tearing the mask from some popular idol, and holding it up before an admiring world in its true light, has taken advantage of the interest in sanitary reform awakened in this city by the beneficent workings of the new law, to reveal some matters of which he has possessed himself concerning sewer gas, plumbers, wealth, etc. Since the discovery of the deadly sewer gas, and the creation of sanitary engineering as its uncompromising foe, the occupation of the plumber has come to be looked upon almost as one of the high arts. The *Tinner and House Furnisher* claims that the plumber has, as it were, become master of the situation; at least, he has taken advantage of it to bring in bills longer than the moral law, and ranging higher than those of doctors and undertakers. Plumber's solder, it has been said, has become as expensive as the gold filling with which dentists plug up cavernous teeth. Of course, the plumber whose health must be prejudiced in order to save that of other people must be allowed the privilege of rak ing in the shekels, untrammeled by nice discriminations as to the relation of the service performed to the length of his bill. But all this is now changed. Plumbers must step down; for it is set forth that plumbers not only enjoy better health, but that they live longer and die gamer than any class of men except professional office holders. Considering their extortions, the knowing New Yorker thinks the death rate among them is not half as great as it should be. He finds no names of plumbers' widows in the Directory, nor any children of plumbers in orphan asylums. He thinks, therefore, sewer gas must be a healthy, life-giving thing, and is considering the propriety of organizing a society for bottling it up to supply to people in the country, who are denied this luxury.

AN ORNAMENTAL WATER JAR AND BASIN.

In the baronial halls of Germany curious and artistic brass reservoirs for holding water are frequently found suspended upon the tapestried walls for the service of guests as they enter the castle. These are usually in shape like old English coffee urns without the stand, and are often engraved with the family coat of arms of the proprietor of the establishment. Underneath the tank is placed, either upon a table, or suspended upon the wall, a basin similar in decoration and style, and calculated to receive the water as it is drawn from the supply above. These were placed either, as suggested, at the entrance hall, or near the exit of the banqueting room, so that the guests could moisten their fingers in the perfumed stream before taking part in the dance. Many of these old pieces may now be found in Germany, and are much sought after by connoisseurs and art collectors, not only for their antiquity and the associations connected with them, but for their decorative and artistic value. The tank and basin given in our illustration is a reproduction of one of these old pieces mounted upon a wrought iron stand, and produces an effect at once striking and graceful, and furnishes an article which would be a handsome and practical adjunct to a modern house.

ORNAMENTAL WATER JAR AND BASIN.

Recent Armor Plate Trials.

An important trial of armor plates was recently made at St. Petersburg on Wilson compound—steel faced—armor and Schneider's Creusot steel armor. The experiments were made 24th November, 1882, at Ochta, near St. Petersburg, on two plates, each 8 feet long by 7 feet wide by 12 inches thick; weight of each about 12¼ tons. The *Engineer* says that one plate was made of steel by Messrs. Schneider & Company, of the Creusot Works, France, and the other was made on Wilson's system, one-third steel, two-thirds iron, by Messrs. Charles Cammell & Company, Limited. Both plates were backed by 12 inches of timber placed horizontally, and two three-quarter inch iron plates supported by diagonal struts. The gun used was an 11-inch Aboukoff breech-loader, the range 350 feet. The projectiles were of chilled cast iron shells, 553½ pounds English—made at Perm, in the Ural. The first shot was fired at Schneider's steel plate. The charge of powder, 132 pounds English. Velocity, 1,506 feet. The projectile was destroyed, but it broke the plate into five pieces. The penetration was 13 inches.

The second round was fired at Schneider's steel plate. The charge of powder was 81 pounds English. The shot was broken up; there was penetration 16 inches. The plate was broken into nine separate pieces. The previous cracks were opened out, three new ones being produced.

The third round was fired at Schneider's steel plate. Charge of powder was 81 pounds English, with a steel shell, Aboukoff make. Seven pieces of the plate remained hanging on to the shattered backing. One piece weighing about one ton was found 13 feet behind the target; ten pieces weighing about three tons together, were scattered on the ground in front. The projectile was found 740 yards to the rear of the target, and was apparently uninjured.

The fourth round was fired at Cammell's compound plate, with a charge of powder 132 pounds English. Velocity, 1,506 feet. The projectile was destroyed. A few cracks produced on the steel face both concentric and radial, but they were of no importance. The front of the shot had splashed on the plate, and the head remained in, so that the penetration could not be ascertained, but, judging from the diameter of the piece wedged in the shot hole, it was thought not to exceed 5 inches.

The fifth round was fired at Cammell's compound plate. The charge of powder was 81 pounds English. The result on the face could not be seen, as the remaining bolt had broken and let the plate fall on the ground face downward before the target.

The total stored up work in the first round at each plate is 8,704 foot tons, implying a power of perforating 16·3 inches of wrought iron. This was, therefore, a severe test, the shot being a full match for 12 inches of compound armor.

Brick Fronts.

The overwhelming desire for a "neat job" has done mischief in brick work. A pressed brick wall is a monotonous thing when brick is used alone. It shows only mechanical precision and exactness, and these qualities become very tiresome when they are exhibited for their own sake and not as means to an end. A slight unevenness in texture and in color helps the look of a wall, and it is the aim of the maker of pressed brick and of the builder to avoid the slightest unevenness. The best looking brick walls, except in the perverted eyes of bricklayers, are those in which the unevenness appears, that is to say, those which are built, not of pressed bricks, but of common bricks, chosen for color. To an artistic eye, for example, the wall of the recently completed addition to Mr. Hunt's *Tribune* building, which is built of selected common bricks, laid in cement, looks better than the face brick used in the principal fronts of the building, although the face brick is relieved of much of what would otherwise be its monotony by the free use of granite in combination with it. The jail attached to the Jefferson Market court house is built of selected common brick, while the court house itself is built of pressed brick, and the superiority, in this respect, of the jail must be evident to everybody who has looked at the two together.

A yet more striking instance is furnished by the new Casino, one of the most admirable pieces of brick work in New York, and the more interesting because there is no stone work worth mentioning, but the whole building is of burnt clay. The brick used here is Collaberg and Croton brick, very carefully selected, and used in the lower walls in alternate bands. The work has in consequence a beauty of color and a beauty also of texture which cannot be attained by the use of the more fashionable material.—*N. Y. Record.*

Case Hardening Low Steel.

There are a number of processes for case hardening low steel or iron. It is desirable to have a carbon covering or envelope that does not evaporate or oxidize quickly at the temperature required for hardening. As the prussiate of potash contains in its anhydrous state only about 19 per cent of carbon, while the potassium, iron, and nitrogen are nearly 80 per cent, it follows that it is too weak in carbon to be very effective in case hardening. As boiling water takes up nearly its own weight of prussiate of potash, a saturated solution may be made, to which is added as much bone charcoal, bone black, or charcoal from leather or horn as will take up the solution, or as much as can be made wet; the mass is then spread out and thoroughly dried in an oven. It will then be ready to mix with whatever may be used to make it adhere to the steel, such as oil, grease, or any other sticky substance. Bone, leather, or horn charcoal can be made by roasting it at a low red heat in a closed vessel, so close that no air can injure the product. A crucible or iron box covered with clean sand will do.

Where a Dollar Makes a Millionaire.

A Russian traveler in the Malay peninsula claims to have found in use there the smallest "coin" in the world. It is a minute wafer made from the juice of a tree. Its value is about the millionth part of a dollar.