up the sky so as to be visible over a large area of the city. Several houses were also blown down in Pittsburg. The center of the storm was north of the great lakes, so that the greatest damage was done on its outskirts.

THE DEEP WELLS OF READING, PA.

The quality of water that may reasonably be expected to be drawn from a selected locality scarcely differs from the geological association or chemical constituency of the rocks underlying the location where a deep well is proposed. The quantity becomes a matter of investigation and judgment from the possibilities of fissures made by the contortions that an otherwise dry rock mayhave received, but also the condition of the superficial drift, or covering soils, as to their water-bearing capacity, for the waters falling upon the surrounding surface are the real feeders to the deep wells in the tilted and contorted strata of the primitive formations.

Chemically speaking, the silicious sandstones and granitic rocks of the azoic age furnish much the purest water, while the limestones and magnesian rocks of the same age furnish an indifferent supply of hard water, derived from a soft surface water filtered through perhaps many thousand feet of the crushed and contorted strata of the magnesian limestone, becoming by absorption saturated with the carbonates of lime and magnesia.

This feature is made still more objectionable where deep wells are bored beneath cities built upon drift-covered rocks that absorb the sewage from a saturated soil. Such locations become a feeder to the deep waterways beneath.

In the case of unsewered cities having a water works and using the cesspool system, the subsoil becomes saturated with foul water that can only find outlet to the surface wells and to artesian wells within the city limits. This is notably so with the city of Reading, Pa., with 60,000 inhabitants, having a water works and no sewerage, save the surface gutters and cesspools. The lower levels of that city are constantly flooded with excess of surface water, which not only invades the cellars, but actually bubbles up in the streets in many places as natural springs of typhoid-engendering water.

It is a well known fact that malarial and typhoid fevers are habitats of this district. This sparkling fever water from common wells is largely used by the laboring people, and sewerage is neglected as too costly by a parsimonious city government. The water from large surface wells is used by some of the brewers for cooling and washing purposes, and finally discharged into the street gutters.

Artesian borings have penetrated deeply into the folded magnesian limestone (calciferous) of the Potsdam period, lying over and against a friable silicious sandstone, also of the Potsdam series, resting upon the base of the Archean rocks forming the outcrop of the "Reading Hills," the most prominent of which are Mount Penn on the east side and Neversink Mountain on the south side of the city. Elevation 1,140 and 1,000 feet above the sea.

Of these wells we give the details as far as can be learned, and the results.

The artesian well at the Lauer brewery was drilled in the old way (steel drills). It was several years in reaching a depth of 2,060 feet, diameter of bore 4½ inches. Location within the city, one quarter of a mile from the Schuylkill River.

In rock the entire distance, the bottom being nearly 2,000 feet below the bed of the Schuylkill and entirely within the folds of the magnesian limestone, which is tilted at the surface to an angle of 60°. This well was piped and used for awhile, but, not yielding enough water for cooling purposes, was closed, the water not being fit for boiler use, carbonates of lime and magnesia being the incrustating constituent.

The artesian well at the Packerack paper mill was bored with steel drills, and is situated within a few rods from the Schuylkill River, at the foot of the incline from Mount Penn.

The upper section of 350 feet is 14 inches in diameter, the lower section of 650 feet is 8 inches in diameter, making a total depth of 1,000 feet, 980 of which is below the bed of the Schuylkill.

Its whole depth is within the magnesian limestone.

In drilling, water fissures were met at the depths of 200 feet, 300 feet, and between 900 and 1,000 feet. It has a 10 inch pipe reaching down 280 feet, at which point the pump chamber is located. The natural level of the water is near the surface, and yields by pumping a constant flow of 200 gallons per minute, or 288,000 gallons per day of 24 hours. When the pump is urged for a 50 per cent additional supply, the water surface drops to the bottom of the pipe, showing that 400,000 gallons per day is the probable limit of its supply. The quality of the water is excellent for the purpose required, the manufacture of paper, but not suitable for boiler use, as it contains carbonate of lime and magnesia in solution.

The well at Barbey's brewery has a diameter of 6½ inches; bored with a diamond drill to a depth of 1,080 feet, or 1,040 feet below the bed of the Schuylkill, which is distant 240 feet. It is piped with 6 inch casing for 300 feet down, at which point is located a 5 inch pump chamber. The pump has a stroke of 6½ feet, working at a uniform speed during 24 hours of the day, with a daily product of 114,000 gallons.

The water is to all appearance as clear and limpid as the purest spring water, and has a constant temperature of 57° Fah. The large supply of water from this well has been in constant use during the past season for cooling purposes in two of Rankin's ice machines, for barrel washing, and all other uses, except boiler feed and brewing water, which is supplied by the city water works.

At no time has the water surface fallen to the bottom of the pump pipe.

This well is 1½ miles from the base of Mount Penn and about the same distance north from Neversink Mountain, and for its whole depth is within the folds of the magnesian limestone, having thin seams of talcose slate in its lower depths.

The stratum nowhere shows horizontal layers, but is tilted along the line of the bore at all angles from 45° to the vertical, while the drill cores, that were drawn out in lengths up to 6 feet, show contortions of the layers within their own diameter.

The well at the Reading brewery, just finished, is located on the slope of the base of Neversink Mountain, is a 6 inch diamond drill bore and has reached a depth of 1,180 feet.

It is entirely within the magnesian limestone having contorted dips, as shown by the cores of from 40° to 80°.

The bottom of this well must be very near the Potsdam sandstone, which crops out on the side of the mountain within five hundred feet.

At 1,000 feet down, nodules of black flint were found, and at 1,100 feet thin seams of talcose slate were met. The yield of water is limited by the present small pump capacity to 36,000 gallons per day. It is clear and sparkling, but only suitable for cooling in the ammonia ice machines and for washing.

Located, as are these wells, so close to the slope of the sides of Neversink and Penn Mountains, it seems that the drills have nowhere in this vicinity penetrated the sandstone that forms the escarpment of these mountains, and which is supposed to extend beneath the magnesian limestone.

The sandstones of most formations,especially if tilted, are water-bearing rocks, and it is much to be regretted that the enterprising projectors of the Reading wells have not continued the borings through the limestone and tapped the water-bearing sandstone beneath.

G. D. H.

PHOTOGRAPHIC NOTES.

Preservative for Mounting Solutions.—Says S. L. Dobie, in the *British Journal of Photography:* Quinine is a very good preservative for mounting solutions—gum, gelatine or glue, starch, arrowroot, white of egg, etc.

In India it keeps gum from mould, and ants and cockroaches won't touch the gum. Sulphate of quinine or, for choice, neutral sulphate, half a grain and possibly less in some cases, to one ounce of the mounting solution will suffice.

Ready Sensitized Paper.—F. York, in the same journal, states that the following is a practical formula. The object is to add citrate of silver and reduce the quantity of citric acid, and thus facilitate the toning.

Nitrate of silver	2 oz.
Water (distilled)	20 "

Dissolve, and add carbonate of soda one drachm, shake, and add citric acid two and a half drachms. When dissolved, filter.

In silvering float the paper for three minutes and blot off with large sheet of blotting paper.

Mercury and Ferrous Oxalate Intensifier.—As given by J. Perkins, in the *Amateur Photographer:* Bleach the negative in the mercury solution, as is usual, then pour over it the ordinary ferrous oxalate developer diluted with a little water. The blackening proceeds so evenly and gradually that one can stop it at the right moment without any difficulty. The oxalate will intensify several negatives in succession. If the negative when black right through to the back is not dense enough, simply repeat the whole operation of bleaching and blackening again as often as necessary. If the water is very hard, after blackening, soak the plate in an alum bath, which will remove the oxalate of lime, should any be present.

For the benefit of our readers, we would say that the ferrous oxalate developer is made by mixing separate saturated solutions of oxalate of potash and sulphate of iron, both of which can be had at any drug store. Use warm water in dissolving, to insure saturation. Crystals will collect at the bottom when solutions cool. Into eight ounces of the clear oxalate of potash solution pour one ounce of the green sulphate of iron solution, which forms the developer.

Photographing Fireworks.—From a correspondent in Melbourne, Australia, we have received two 4¼×6½ bromide prints from negatives made at a pyrotechnic display. The pictures represent a portion of the display entitled the "Destruction of Pompei," and show the same before and during the eruption.

It was a clear, starlight night, the lens was at full aperture, and remained uncapped for two minutes for each picture. One view, we presume before the destruction, appears to be very much brighter, but lacks the sharpness to be obtained when the lens is stoppered down, or when the plate is backed by a non-reflecting substance. The arrangement of the buildings, with a distant view of the mountain, are, however, very distinctly shown.

Pictures of this kind made on celluloid films or paper films would show much better, since halation by the bright lights would be avoided.

International Photographic Exhibition.—An exhibition of this character is to be held in March of this year at the Crystal Palace, London, England. American exhibitors may send unframed exhibits by mail, and will not be required to pay for wall space. The only condition is that the photographs shall not be returned to the senders. The pictures will be equally eligible with others for awards, unless not desired by the exhibitors.

Mr. Henshaw Russell, Crystal Palace, London, S. E., will correspond with any intending exhibitors.

Trial of an Electric Car Brake.

The Widdifield & Bowman electric car brake was subjected to a series of tests on January 10, a train of fifteen freight cars being used for the trial, which took place upon the Lehigh Valley Railroad between Metuchen and Easton. A drum about six inches in diameter is cast around the axle of a pair of car wheels. The drum is composed of Babbitt metal, with paper disks embedded in it. A small friction wheel is drawn against this by the action of a magnet excited by the electric current. Only an instant is required to do this, as a ratchet bar and pawl are provided to hold the wheel in place when forced against the friction drum. At once the wheel begins to rotate, and in doing so winds a chain around its axle. This draws a larger wheel with of course greatly increased power against the friction drum. It rotates, and winds the brake chain directly around its axle, thus putting on the brake. To release the brakes, another current is sent, which operates a second magnet that unlocks the pawl and ratchet, the friction wheels fall back, and the brakes cease to act upon the periphery of the wheel.

Two storage batteries of ten or twelve cells each are carried, one on the engine and the other in the rear car. With each battery is a switchboard and connections. Thus if the train breaks in the middle, each half is provided with a full brake equipment. An automatic attachment is so arranged that if the train is cut in two by design or accident, the brakes are at once put on. But each switchboard contains a releasing switch, so that if the cut-off occurs in a place where stoppage would be dangerous, the brakes can be released on either or both portions of the train. Attachments are also provided so that brakes can be put on from the roof.

The main battery is kept on open circuit, and is only closed for an instant, when the brakes are to be actuated. One or two cells are kept on closed circuit to operate the automatic part. Thus there is a very slight waste of electricity. In all the trials, which included emergency and service stops, cutting off portions of the train, etc., the mechanism worked perfectly, and it seemed well adapted for its ends. Its cost was stated to be but a small fraction of that of an air brake equipment. The trials were witnessed by a number of representative railroad engineers and journalists.

Eclipse of the Moon.

The eclipse of the moon which occurs on Wednesday, January 16, visible generally over the United States, Europe, Africa, and the Atlantic and Pacific Oceans, has a duration of nearly six hours, during which the obscuration reaches seven-tenths of the lunar diameter.

The moon enters the penumbra at 9 h. 41 m., the shadow at 11 h. 2 m., and reaches the middle at 33 minutes past midnight, ending at 3:25 A. M., January 17. For the vicinity of New York City, this eclipse affords an opportunity for photographic work of amateurs and others of a most satisfactory kind, the slow and undefined motion of the moon giving good images by the use of the improved sensitive plates and short exposures. For Philadelphia and vicinity, the phases are about 5½ minutes earlier, while at Boston they are about 12 minutes later.

Bursting of a French Gun.

On December 12 last, one of the 48 ton breech-loader guns of the French battle ship Amiral Duperre burst, while firing at a target off Toulon. An officer and five men were killed. This gun was one of the finest examples of the built-up system, of which many disastrous failures are on record. Those who brag so much about these guns, and are so ready to denounce cast guns, have considerable still to learn.