ROMAN GLASSWARE.

One of the engravings on this page represents the opposite sides of the celebrated Barberini or Portland Vase, now in the British Museum, and said to be the most beautiful example known of glass of two layers. This vase, which is about ten inches in height, was found some three hundred years ago in a marble coffin within a sepulchral vault near Rome. From slight evidence the tomb has been thought to be that of the Roman emperor Alexander Serverus, who died A. D. 235. The extreme beauty of the vase led Montfaucon and other antiquaries to mistake it for real sardonyx. More critical examination proved it to be composed of dark blue glass, of a very rich tint, on the surface of which are delineated in relief several minute and elaborately wrought figures of opaque white enamel. Experts in glass-making say that the figures must have been moulded separately, and afterward fixed to the blue surface by partial fusion. The union has been effected with such extraordinary care and dexterity, however, that no trace of the junction can be detected, nor have the most delicate lines received the slightest injury. The work is supposed to date from about 138 B. C. For two centuries after its recovery it was the principal ornament in the Barberini palace in Rome; then it was purchased by the Duke of Portland for £1,029, and placed in the British Museum.

THE BARBERINI OR PORTLAND VASE.

A feature peculiar to Roman glassware was the production of "double" glassware. This was composed of several layers of glass of different colors. The innermost layer was either quite dark or very light, and was covered by a layer formed of various figures and decorations in different colors, and covered by a third transparent layer. In this way very beautiful effects were obtained. The precise way in which these goods were produced is not known, and we have not been able to produce anything of this character equal in beauty to the few examples of this ware that have been preserved.

Paper from Grass.

One of the subjects of a recent patent is the manufacture of paper pulp and paper from common grass. The patentee claims that grass treated when green and reduced to pulp, has a very flexible, silky, long, and tenacious fiber, which, when made into paper, assimilates linen paper, and, if anything, possesses greater softness and transparency. Any of the common field, lawn, or meadow grasses can be used, and for this purpose it is best that the grass should be cut or mowed before it begins to bloom; but young or old may be used so long as the sap is yet in circulation and the chlorophyl, silica, and other organic and inorganic matters are not dried in, which is found to make a serious change in the quality of the fiber for the purpose of paper.

After the grass is cut or mown it is passed between the rollers of a "roller press," which squeeze out the main portion of the sap and crush or loosen the fiber. When the grass has been passed through the roller press, it is next placed in a large tank of water, in which it is thoroughly washed by agitation or other suitable means, so as to remove the dirt. The water of the tank may be either warm or cold, and the tank is constructed with a perforated "false bottom," on which the crushed grass rests and through which the dirt falls into the compartment below, from which a pipe extends to allow the dirt and wash-water to escape. When the crushed grass is sufficiently washed it is boiled in an open kettle or in a steam kettle with lye, in proportions of about one tenth of a pound of caustic soda, or two tenths of a pound of caustic potash, or six tenths of lime to one hundred pounds of grass. The boiling is continued when an open kettle is used for from four to five hours, but when a steam kettle is used, two hours will suffice.

After the boiling operation is completed the material is removed from the kettle and put into a feltering trough, in which it is beaten and feltered from one to two hours. After this it is washed until clean in clear water.

The coarse pulp or felt thus produced is refined and bleached for the production of fine papers as follows: It is first placed in a cold solution of carbonate of soda for about fifteen minutes; next in a dilute solution of sulphuric acid for about the same time, and again in a solution of carbonate of soda. It is then placed in a solution of chloride of magnesia for about thirty minutes, and after this it is placed a third time in a solution of carbonate of soda; and, finally, a second time in a solution of sulphuric acid. These operations may be repeated more or less till the pulp is as fine and white as required, after which it is finally washed in clear water. Another method is to felter the crude pulp with water glass and bleach it with a solution of chloride of lime or chloride of soda. Still another is to bleach the crude pulp in chlorine gas, then in a solution of chloride of soda, and finish with water glass, after which the pulp is washed with clear water.

Papers produced from this green grass pulp are said to possess the qualities of great strength and length of fiber, tenacity, softness, and flexibility. For tissue, drawing, writing, and copying papers the material is said to be admirably adapted, as it provides a fine writing surface and superior transparency even without the use of any size.

In its economical aspect, one square foot of ground gives, in the whole year, from 0·7 to 1·5 of a pound of green grass, making from 30,492 to 65,340 pounds to the acre. One pound of green grass makes one fourth to one sixth of a pound dried, or 11,979 pounds dried grass to an acre. Finally, one pound of dried grass gives about one third to one fourth of a pound of fine bleached and finished paper, or 2,911 pounds of finished paper to the acre of ground.

ANCIENT ROMAN GLASSWARE.

The Great Locomotives of the Erie Railway.

A correspondent of the New York *Times*, writing from Port Jervis, states that when the Erie Company (now New York, Lake Erie, and Western) commenced preparations to lay a third rail, plans were drawn by the chief engineer, Octave Chanute, for a class of large locomotives, which would be narrow gauge, weighing fifty-two tons, and with eight wheels. It was thought that a class of engines such as this could be used to advantage on the heavy grades on the Erie. Four of these large locomotives were constructed at the shops of the company at Susquehanna. These were tried upon the Jefferson Branch, a road that extends from that place to Carbondale, Pa. This road is thirty-eight miles long, and consists of two hills, each nineteen miles long, where may be found the heaviest grade on the Erie lines. Proving satisfactory, a contract was given to the Grant Locomotive Works, of Paterson, N. J., for thirty locomotives, to comply in every particular with the specifications of the company. These engines were numbered from 520 to 549 inclusive, and were delivered during the winter of 1878–9. Four of these locomotives were put upon the Delaware Division and twenty-six upon the Eastern, and it was upon the latter that the most difficulty was experienced. But as summer approached the large engines became more manageable, and more cars were added to their complement, until at last a maximum number was attained. This was a train of forty loaded cars. Starting from Port Jervis with forty cars, they are assisted up the "hill," extending from this place to the top of the Shawangunk Mountains, a distance of nearly twelve miles, by a pusher engine; then they draw their trains to what is known as Goshen grade, a short hill just west of that village, which is less than a mile long, and here assistance is needed. From there to Greycourt they proceed alone. At this point the heaviest grade on the Eastern Division commences. It is less than three miles in length, but assistance is required. Arriving at the top of Oxford, as it is called, they enter the Ramapo Valley, and from there to Jersey City they need no help. At Port Jervis there are five pushers, at Goshen one, and at Greycourt two, each manned by gangs of two men, working alternately night and day. Altogether there are eighteen gangs of men which are needed to assist these large engines with their trains of forty cars, and it might look to those who are not acquainted with the manner in which the business was formerly conducted, that the road had gained nothing. But to show how deceptive are appearances, it is only necessary to present the other side of the case.

Formerly there were two classes of locomotives—four and six wheel connected—the former starting from this place with sixteen cars and the latter with eighteen and twenty. They were not provided with pushers at any point with the exception of Oxford grade, where one pusher was kept. But it was the exception to use it. Arriving at Turner's, forty-two miles distant from here and forty-five from Jersey City, the trains "filled out" with ten cars, their trains from that point consisting of twenty-six, twenty-eight, or thirty cars, as the case might be. To secure their complement of cars, it was necessary to have them transported there, and this was done by "turning" one third of the gangs and sending them back to Port Jervis. No light or empty cars were to be secured, except such as were lying at way stations, and generally one or two engines were sufficient to do the work, and consequently eight out of ten came back "empty," the gang of seven men taking it easy, generally all but the fireman going to sleep in the caboose, leaving him to run the engine and

caboose to Port Jervis. For this they were paid at the rate of one day. Consequently, where it formerly took thirty engines to haul six hundred cars over the road, it now only requires fifteen, assisted by the pushers stationed at the various points. Dividing the sixteen additional "pusher" gangs, or forty-eight men, by seven, the number comprising an ordinary freight gang, gives about seven full gangs, which, added to the fifteen saved in the number of trains, makes twenty-two, leaving a clear saving to the company of eight gangs of men and eight locomotives in hauling six hundred cars from Port Jervis to Jersey City. In handling the traffic of the Erie, which ranges from twelve hundred to two thousand cars daily, the cost is correspondingly decreased as regards the pushers, as the same number is used for the greater traffic as for the less. In handling twelve hundred cars, sixteen gangs are dispensed with, and eighteen hundred, twenty-four gangs. The time consumed in running between these points is not much lengthened. The experience thus gained resulted in the ordering of ten more of these monster locomotives, which have just been placed upon the road.

Keeping the Boys on the Farm.

In an extended argument as to the desirability of farmers' sons sticking to the farm, the Cincinnati *Commercial* observes that there is a feature in this matter of sons following the calling of their fathers that is not sufficiently regarded.

"The calling of the father may rise to a higher dignity when the sons adopt the business, thoroughly learn it, and zealously and proudly pursue it. Then the accumulated reputation, capital, and business of the parent can be inherited and preserved by the sons.

"Again, it is a law of nature that holds good in all the animal kingdom, that aptness for any business may be inherited, or may be bred, as we say of stock. The great desideratum in developing a race of trotters is to insure an aptness to trot. And this comes not from stock that has habitually been used for the draught or chase or race course. If the dam trots and the sire trots we do not expect the offspring to be a running horse.

"The old Spartans understood this law of developing an aptness for a given calling in the children. The Germans of olden times developed a race of warriors on the same principle.

"The law of heredity is so broad and so powerful in its influence that it extends not only to color and form of our race, but it extends to the temperament and even to the tastes. The taste, though like the muscle and reasoning faculties, may be improved by education. Still the taste for and aptness for any calling may be increased from generation to generation.

"Then, if we are to reach the highest development as a race of farmers, we must expect it through the line of descent. The son must inherit the fitness of the father, and take up the calling and business where he left off, and his son after him, and so on. When this shall become the custom in our farming families, then shall we see greater stability in society and a higher type of civilization. Every parent has the chief power to bring this work about. The very independence of the farmer's life is to be the germ which develops a race that can not be other than an independent people. Our nation is to achieve its greatness in the development of agriculture. Its power at home and abroad is to be established and held through the arts of husbandry, practiced by a skillful and virtuous race of farmers. All then that can be done by the state or family to ennoble and to dignify the calling, and to entail its blessings and influence from father to son, will add to the stability and grandeur of the nation."

Rainfall and Forests.

Some interesting observations have lately been made touching the influence of forests on rainfall, at the School of Forestry, Nancy, France. The results of these observations, made during the past six years, are summed up by the sub-director of the school as follows:

1 Forests increase the quantity of meteoric waters which fall on the ground, and thus favor the growth of springs and of underground waters. 2. In a forest region the ground receives as much and more water under cover of the trees than the uncovered ground of regions with little or no wood. 3. The cover of the trees of a forest diminishes to a large degree the evaporation of the water received by the ground, and thus contributes to the maintenance of the moisture of the latter and to the regularity of the flow of water sources. 4. The temperature in a forest is much less unequal than in the open, although, on the whole, it may be a little lower; but the minima are there constantly higher, and the maxima lower, than in regions not covered with wood.

These results substantially corroborate those made by M. Fautrait, when sub-inspector of the forests at Senlis, France, and given as follows:

1. It rains more abundantly, under identical circumstances, over forest than over non-wooded ground, and most abundantly over forests with trees in a green condition. 2. The degree of saturation of the air by moisture is greater above forests than over non-wooded ground, and much greater over masses of *Pinus sylvestris* than over masses of leaved species. 3. The leafage and branches of leafed trees intercept one third, and those of resinous trees the half of the rain water, which afterward returns to the atmosphere by evaporation. On the other hand, these same leaves and branches restrain the evaporation of the water which reaches the ground, and that evaporation is nearly four times less under a mass of leafed forest than in the open, and two and one third times only under a mass of pines. 4. The laws of the change of temperature out of and under wood are similar to those which result from the observations of M. Mathieu. The general conclusions seem to be that forests regulate the function of water, and exercise on the temperature, as on the atmosphere, an effect of "ponderation" and equilibrium.

ATTRACTION.

In looking over the early volumes of the SCIENTIFIC AMERICAN, a few days ago, the memories of the past were vividly brought to mind by reading the following poetry, which appeared in the first column of the first issue of this paper, dated August 28, 1845. We wondered as we read this how many of our present patrons remember reading the effusion when it first appeared:

Attraction is a curious power,
  Thatnone can understand:
Its influence is everywhere—
  In water, air, and land;
It keeps the earth compact and tight,
  As though strong bolts were through it:
And, what is more mysterious yet,
  It binds us mortals to it.

You throw a stone up in the air,
  And down it comes—ker-whack;
The centrifugal casts it up—
  The centripetal—back.
My eyes! I can't discover how
  One object 'tracts another;
Unless they love each other, like
  A sister and a brother.

I know the compass always points
  Directly to the pole:
Some say the North Star causes this,
  And some say—*Symms's Hole!*
Perhaps it does—perhaps it don't;
  Perhaps some other cause;
Keep on *perhapsing*—who can solve
  Attraction's hidden laws?

A fly lights on a 'lasses cup—
  Attraction bids him woo it;
And when he's in, attraction keeps
  The chap from paddling through it.
Attraction 'lures the sot to drink,
  To all his troubles drown;
But when his legs give way, he falls,
  And 'traction keeps him down.

Attraction is a curious power,
  That none can understand:
Its influence is everywhere—
  In water, air, and land.
It operates on everything—
  The sea, the tides, the weather;
And sometimes draws the sexes up,
  And binds them fast together.

Do It Well.

Whatever you do, do it well. A job slighted, because it is apparently unimportant, leads to habitual neglect, so that men degenerate, insensibly, into bad workmen.

"That is a good rough job," said a foreman in our hearing, recently, and he meant that it was a piece of work not elegant in itself, but strongly made and well put together.

Training the hand and eye to do work well leads individuals to form correct habits in other respects, and a good workman is, in most cases, a good citizen. No one need hope to rise above his present situation who suffers small things to pass by unimproved, or who neglects, metaphorically speaking, to pick up a cent because it is not a dollar.

Some of the wisest law-makers, the best statesmen, the most gifted artists, the most merciful judges, the most ingenious mechanics, rose from the great mass.

A rival of a certain lawyer sought to humiliate him publicly by saying: "You blacked my father's boots once." "Yes," replied the lawyer, unabashed, "and I did it well." And because of his habit of doing even mean things well, he rose to greater.

Take heart, all who toil! all youths in humble situations, all in adverse circumstances, and those who labor unappreciated. If it be but to drive the plow, strive to do it well; if it be but to wax thread, wax it well; if only to cut bolts, make good ones; or to blow the bellows, keep the iron hot. It is attention to business that lifts the feet higher up on the ladder.

Says the good Book: "Seest thou a man diligent in his business, he shall stand before kings; he shall not stand before mean men."

The Western Union Telegraph.

The annual report of the President of the Western Union Telegraph, for the year ending June 30, 1879, contains a statement showing the mileage of lines and wires, the number of offices, and the traffic of the company for each of the past fourteen years. In 1866 the company owned 37,380 miles of line with 75,680 miles of wire, and had 2,250 offices. The number of messages sent is not given, but would appear to have been about 5,000,000. The increase in traffic year by year has been much more rapid than in the amount of wire or the number of offices. Last year the company had 82,978 miles of line, 211,566 miles of wire, 8,534 offices, and sent upward of 25,000,000 messages, on which the charges were nearly $11,000,000, and the profits $4,800,000 The capital stock of the company is, in round numbers, $41,000,000.

Effects of Atropine and Pilocarpine.

Some interesting experiments on the local antagonism of atropine and pilocarpine were recently communicated to the Académie des Sciences by M. Strauss. If one or two centigrammes of nitrate of pilocarpine are injected beneath the skin of a man, at the end of from two to five minutes the skin covering the injected liquid reddens, and then is covered with very fine droplets of sweat, which appear first not at the point of the injection, but at the circumference of the area, and extend concentrically to the center, finally covering the whole area. This local sweat occurs two or three minutes before the salivation, and five or eight minutes before the general perspiration, and it is the more pronounced the greater is the number of sudiparous glands at the spot; the best places being the forehead or front of the sternum; the back of the arm, where injections are most frequently made, being the least favorable, and for this reason probably the phenomenon has escaped observation. Reducing the dose, the effect of the injection becomes ultimately strictly local, without the slightest general sweating. Thus, at will, this or that part of the skin may be made to sweat, or lines of sweat may be produced on an otherwise dry skin. The dose with which the effect is purely local is from one to four milligrammes.

By means of subcutaneous injections of atropine the opposite effect may be obtained. If, when a person is in full sweat from the effect of pilocarpine, very minute does of sulphate of atropine are injected under the skin, the perspiration lessens at the spot almost immediately, and in a few minutes it is totally suppressed. Thus dry areas and lines may be at will produced upon the moist skin. In order to ascertain that the arrest of the perspiration is really the result of the atropine, and not of the mere injection of liquid, an equivalent volume of pure water was injected at certain spots, but without causing any arrest of the perspiration. The dose of atropine which will arrest the sweating is extremely small. One-millionth of a gramme of atropine never failed to produce it in man, and in the cat one-hundred-thousandth of a gramme was sufficient. The sweating skin is thus a test of atropine of extreme delicacy. The sensibility of the sudiparous glands to atropine is greater even than the iris, since the millionth of a gramme of atropine produces no appreciable dilatation of the pupil.

Treatment of the Hair.

How to preserve the hair is a subject which seems to interest almost everybody, if we may judge from the frequent inquiries from every direction which come to this office. One wishes to know what will prevent baldness, another how to preserve their hair from turning gray, another how to eradicate dandruff, etc. Now it is a delicate matter to recommend any special treatment, but Professor Wilson, of England, who is deemed high authority on the hair, condemns washing it, and advises, instead, thorough brushing. This promotes circulation, removes scurf, and is in all respects, he says, better than water.

Cutting the hair does not, as commonly thought, promote its growth. Most of the specifics recommended for baldness, not excepting petroleum, are mere stimulants, and are seldom or never permanently successful. Some of them give rise to congestion of the scalp. When a stimulant is desirable, ammonia is the best. It is safe.

For falling out of the hair, Dr. Wilson prescribes a lotion composed of water of ammonia, almond oil, and chloroform, one part each, diluted with five parts alcohol, or spirits of rosemary, the whole made fragrant with a drachm of oil of lemon. Dab it on the skin, after thorough friction with the hair brush. It may be used sparingly or abundantly, daily or otherwise.

For a cooling lotion, one made of two drachms of borax and glycerine to eight ounces of distilled water is effective, allaying dryness, subduing irritability, and removing dandruff.

Both baldness and grayness depend on defective powers of the scalp skin, and are to be treated alike. What is needed is moderate stimulation, without any irritation. The following is good: Rub into the bare places daily, or even twice a day, a liniment of camphor, ammonia, chloroform, and aconite, equal parts each. The friction should be very gentle.

High Wind Velocities.

In its review of the hurricane which swept along our Southern Atlantic seaboard, August 18, the Weather Bureau reports that the wind velocities, noted as the central vortex neared Cape Lookout, were among the highest, if not the highest, which have ever been recorded. At Cape Lookout, at 6:30 A.M., of the 18th, the barometer falling very rapidly, the cups of the anemometer were blown away while the instrument was registering a wind velocity of 138 miles per hour. But this was not the maximum. An hour and a half later, as the storm center began to pass away, and the barometer to rise, the wind rose to the estimated velocity of 165 miles per hour. An observed velocity of 100 miles an hour was also reported from Cape Henry. The highest winds attending storms near sea level, with which these can be compared, are perhaps those of the Liverpool storm of February, 1868—from 100 to 120 miles an hour—and those of the great Guadeloupe hurricane of 1865, from 100 to 130 miles.

THE St. Gothard Tunnel, which will measure 14,920 meters when completed, has now reached a length of 13,229 meters. It is hoped that by the beginning of December the gigantic work will be finished.