An improvement in commodes has been patented by Mr. Andrew Climie, of Ann Arbor, Mich. The object of the invention is to prevent the unpleasant odor arising from a water closet, especially such as are used in railway cars, and to inclose the deposits and convey them away.

An improved nail for the soles of shoes, so formed that after being driven and having its head removed the nail will have a four pronged appearance, has been patented by Mr. Zephaniah Talbot, of Holliston, Mass.

An improved refrigerating and ice making apparatus has recently been patented by Mr. Charles P. G. Linde, of Munich, Germany. The improvements relate to that class of refrigerating or ice making apparatuses in which the refrigerating effect is obtained by the evaporation of a volatile liquid, the vapors of which are compressed by a pump into a condenser, and then liquefied ready to be again subjected to the process of evaporation. The object of this invention is, first, to prevent overheating of the pump; second, to effect a more perfect packing of the stuffing box of the pump, and the employment of the stuffing medium for the lubrication of the points of contact of the working parts; third, to provide means for replenishing the apparatus with pure liquid ammonia while in operation; fourth, to provide means for the production of transparent ice and the means for discharging the same from the carriers.

Mr. Samuel A. Bollinger, of Patterson, O., has invented a harrow so constructed that either side or the whole harrow can be raised from the ground to clear it from rubbish and to pass roots, grass, and other obstructions.

AN IMPROVED HARVESTER.

Although the general principle of the reaper shown in the engraving is common to many machines of this class, the particular machine illustrated embodies several novel improvements of considerable merit which render it superior. The machine is constructed throughout with a view to convenience in handling, to strength and durability, and at the same time the new features render it very efficient.

The frame containing the running gear is composed of two iron end pieces and two wrought iron side pieces, secured together by bolts or rivets. The outer side piece supports an adjustable slide, to which is attached the seat spring, thus making the seat adjustable, so that the driver may move it either backward or forward to balance the machine and relieve the necks of the horses from undue weight.

The inner side piece of the main frame carries an adjustable foot piece which forms a guide for a vertical bar, the lower end of which is jointed to the side bar of the platform or table. On the upper end of the vertical bar there is a hand lever, which is connected by a rod with the side bar of the platform, a short distance back of the vertical bar, so that by moving the lever the platform may easily be tipped one way or the other as may be required. The lever is provided with a bolt or latch, which retains it in any desired position by falling into one of several notches in a sector secured to the top of the vertical bar.

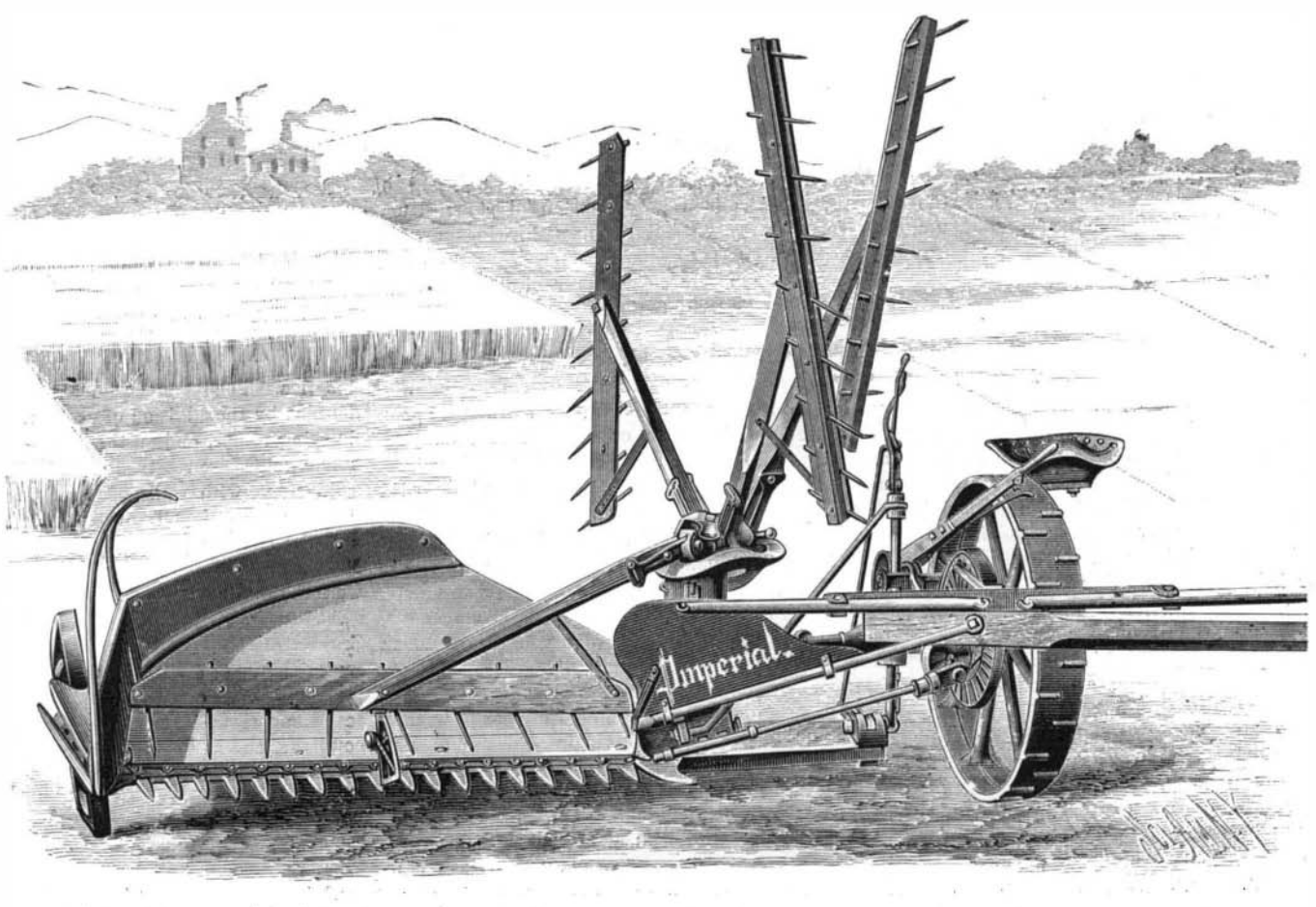
Upon the foot piece which guides the vertical bar there is a ratchet and chain wheel for winding a chain connected with the inner end of the platform. A lever carrying a pawl is adapted to work the ratchet wheel so as to raise or lower the inner end of the platform by winding or unwinding the chain. A holding pawl is provided for retaining the ratchet wheel in any desired position.

The crank shaft and gearing intermediate between it and the axle are supported by journal boxes attached to the main frame. Side draught is avoided by attaching the tongue to the inner side of the frame. The automatic rake is of a well known type, which will be recognized by those of our readers familiar with agricultural machines.

The appearance of this machine is trim and workmanlike, and it seems well adapted to the work for which it is designed.

The adjustments, which are calculated to meet every requirement, are all easily made. The working parts are of wrought and cast iron and steel.

This machine is made by Messrs. Crawford & Co., at their Globe Agricultural Works, London, Ontario, Canada. The name given the machine is "The Imperial Harvester."

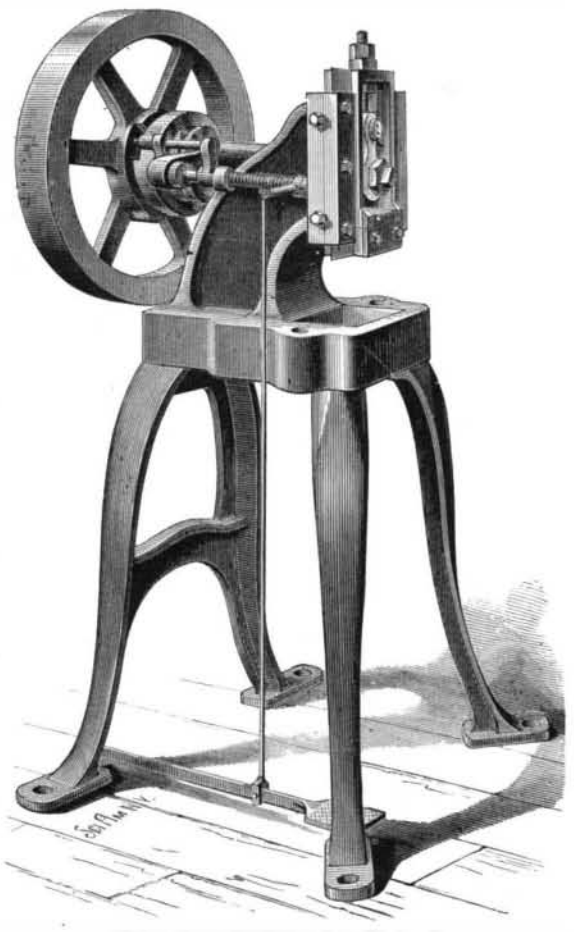


THE "IMPERIAL HARVESTER."—MADE BY CRAWFORD & CO. LONDON, ONTARIO CANADA.

A NEW PUNCHING PRESS.

The Peerless Punch and Shear Company, 52 Dey street. New York, have just completed a new power press for punching sheet and bar metals, similar in design to their No. 1 foot press, of which we published illustrations in September last, excepting that the treadle and pendulum are replaced by a balance wheel for belt power.

One of these presses, although weighing but 500 lb., will punch a ½ inch hole in ¼ inch iron, or 1 inch hole in ⅛ inch iron, and will cut a blank 6½ inches square from No. 14 iron or brass. If used as a shear, it will cut bar iron 2 inches by ¼ inch in thickness, or ⅝ inch round.



PEERLESS POWER PRESS No. 1.

The wheel is 22 inches diameter and weighs 130 lb. The design embodies great strength, while the press occupies floor space only 2 feet 3 inches by 2 feet 11 inches. Many of this style of presses are sold with a pendulum attachment to be worked by foot power when steam is not available. This is a great convenience, as the operator is not altogether dependent upon steam power, and can use his press at any time by merely taking off the balance wheel and putting on the pendulum in its place.

Covington, Iowa, Threatened.

In several instances thriving towns on the treacherous banks of the Mississippi and the Missouri rivers have been wiped out by the erosion of the river banks. Covington, Iowa, according to the Sioux City *Journal*, is another doomed city. It stands on a bend of the Missouri River, where the banks are being gradually eaten away. Many feet of fast flowing water now sweep over the spot where the court house stood a year ago. Recently the current set in shore and took off a strip of land thirty feet wide in a few hours. No invasions were made for another week, when another slice was cut off. Then about half a dozen buildings were moved back about some thirty feet, and the next day the land on which they had stood was all gone. The citizens have tried to moor trees and logs to the bank in the hope of forming a barrier for the flood, but the current is so swift and the water so deep that these attempts have failed. To give an idea of what the town of Covington has suffered in the past five years, the case of the ferry house and the principal hotel may be instanced. Two years ago there were six hundred and sixty feet of land between the building and the river bank; now you can toss a stone out of the hotel window into the river, and buildings are now being put on rollers for removal.

Hatching Spanish Mackerel.

Professor Earle, of the United States Fish Commission, has discovered that Spanish mackerel can be hatched artificially, and that its capacity of reproduction is many times that of the cod or the shad. Professor Earle received his first hint in regard to Spanish mackerel from Chesapeake fishermen, who reported that large numbers of them annually frequented the inland waters near Chrisfield, Md., and Mob Jack Bay. On being directed by Professor Baird to make experiments there with hatching apparatus, Professor Earle was surprised to find that the fish were hatched within eighteen hours from the time the milk and spawn were brought together. It requires five days to hatch shad, and from eight to twelve days to hatch cod. The number of eggs operated upon at a single hatching was between 200,000 and 300,000, while of shad only about 20,000 to 30,000 can be turned out at once.

Another fact of importance is that the season for operations with the spawn of the Spanish mackerel is toward the last of June and first of July, after the shad season is over, and before that of cod begins. It is estimated that the number of young fish "turned out" this season will be more than a hundred million.

How Mr. Hannay Made his Diamonds.

Mr. G. B. Hannay, in a recent number of the "Proceedings before the Royal Society," gives an interesting account of the method employed by him in starting and prosecuting his experiments in making diamonds. And if only as a record of indomitable perseverance against ever-increasing difficulties, of scientific acumen, and of the true application of the Baconian method of research, as the London *News* justly says, it is worthy of study. Some idea of the nature of the investigation may be obtained from the fact that out of complex and expensive experiments only three succeeded. Violent explosions were frequent; furnaces were blown to pieces; steel tubes burst, scattering their fragments around. On other occasions, tubes which had been carefully prepared, filled, welded, and nestled in a reverberatory furnace for many hours, were found to have leaked and spoiled the experiment. "The continued strain on the nerves," writes Mr. Hannay, "watching the temperature of the furnace, and in a state of tension in case of an explosion, induce a nervous state which is extremely weakening, and when the explosion occurs it sometimes shakes one so severely that sickness supervenes." The diamond-making experiments were started in September, 1879, when Mr. Hannay made many attempts to find a solvent for the alkali metal, sodium, potassium, and lithium. But in no instance could such a solvent be found which did not, in the gaseous state, and under pressure,

unite with the alkali. Even in the case of hydrocarbons, such as paraffine spirit, containing only hydrogen and carbon, the alkali combined with the hydrogen, setting free the carbon. Now, as we know, diamond is pure carbon; hence, when this element was set free from a pure substance, it was thought that conditions of pressure and temperature might eliminate it in the hard, crystalline, adamantine form, namely, as diamond. Glass tubes were first employed, but, although of great thickness in comparison with their bore, they were found to be insufficiently strong, and they were replaced by wrought iron tubes twenty inches long by one inch diameter, and having the diameter of the bore half an inch. In these lithium was heated for many hours to a high temperature in paraffine spirits, and on subsequently opening the tube carbon in a hard form was found within it. Great difficulty was experienced in getting the tubes perfectly airtight, and eventually the open end was welded at a white heat, and by that means alone did it resist leakage. Sometimes tubes would burst with an explosion like a gun. A tube twenty inches long by two and three quarters diameter and one half inch bore was filled with a hydrocarbon made from bone oil, to which some charcoal powder was added in order to keep an excess of carbon in the tube. Its open end was welded, and it was heated for fourteen hours with lithium. On opening it a quantity of gas appeared and some minute pieces of hard carbon which had evidently separated out from solution. Another similar tube burst at the end of eight hours' heating. A tube of cast iron, no less than three and three quarter inches diameter, and with a bore of only three quarters of an inch, exploded at the end of an hour with a fearful report, wrecking the furnace. Several tubes of steel also burst under the enormous pressure, at last shattering the top of the furnace. The author remarks that in nature the temperature must at one time have been much higher than anything we can now produce artificially; while the pressure obtained at a depth of two hundred miles below the earth's surface is greater than that which any of the materials from which we can form vessels can resist.

We come now to the great experiment which resulted in the artificial production of veritable diamonds. A tube twenty inches long by four inches diameter, of coiled Low-moor iron, was bored so as to have an internal diameter of half an inch. Thus the central bore was surrounded by walls of iron one and three quarter inches thick, and, of course, capable of resisting an enormous pressure. In the tube was placed a mixture of ninety per cent of bone oil and ten per cent of paraffine spirit, together with four grammes (about sixty-two grains) of the metal lithium. The open end of the tube was welded airtight and the whole was then heated to redness for fourteen hours, and allowed to cool slowly. On opening it a great volume of gas rushed from the tube, and within was found a hard, smooth mass adhering to the sides of the tube. "It was quite black, and was removed with a chisel, and as it appeared to be composed principally of iron and lithium, it was laid aside for analysis. I was pulverizing it in a mortar, when I felt that some parts of the material were extremely hard—not resisting a blow, but hard otherwise. On looking closer I saw that these were most transparent pieces embedded in the hard matrix, and on triturating them I obtained some free from the black matter. They turned out to be crystalline carbon, exactly like diamond."

Such is Mr. Hannay's account of his discovery. Subsequent chemical and optical analysis has proved that these hard shining crystals are, in every respect, true diamonds. The cost is obviously great; so, also, is the danger to life and property; and the great difficulties to be overcome render disappointments common. What we now want is to get vessels of a material sufficiently strong and non-porous to resist the high pressures and temperatures upon which the success of the experiment depends. What we have learned, among other things, from the brilliant researches of MM. Cailletet and Pictet, which led to the liquefaction of the so-called permanent gases, and from Mr. Hannay's experiments, described above, is, that we must push the forces of nature to their utmost strain by using our most powerful mechanical devices for producing pressure, our strongest materials for resisting it, and our intensest means of producing both heat and cold.

The High Buildings of the World.

The crown of the hat of the statue of William Penn, which is to surmount the tower of the new public buildings of Philadelphia, will be just 535 feet above the pavement. This is 10 feet 1 inch higher than the highest towers of the Cologne Cathedral as they now stand. The Penn Square tower, however, will ultimately be overtopped by the Cologne towers 41 feet 9 inches, their intended height being 576 feet 9 inches. The heights of the other chief lofty buildings of the world are given as follows:

Tower of St. Nicholas' Church, at Hamburg, 473 feet 1 inch; cupola of St. Peter's, Rome, 469 feet 2 inches; cathedral spire at Strassburg, 465 feet 11 inches; pyramid of Cheops, 449 feet 5 inches; tower of St. Stephen's, Vienna, 443 feet 10 inches; tower of St. Martin's, Landshut, 434 feet 8 inches; cathedral spire at Freiburg, 410 feet 1 inch; cathedral of Antwerp, 404 feet 10 inches; cathedral of Florence, 390 feet 5 inches; St. Paul's, London, 365 feet 1 inch; ridge tiles of Cologne Cathedral, 360 feet 3 inches; cathedral tower at Magdeburg, 339 feet 11 inches; tower of the new Votive church, at Vienna, 314 feet 11 inches; tower of the Rath-haus, at Berlin, 288 feet 8 inches; Trinity Church, New York city, 284 feet; and the towers of Notre Dame, at Paris, 232 feet, 11 inches.

AMERICAN INDUSTRIES.—No. 52.

WINE MAKING.

To have styled this branch of business an *American* industry a few years since would have provoked a smile. Now, however, it is becoming generally understood that the productions of American vineyards are affording the means by which the home demand may be supplied, and that in some cases American wines have won an enviable distinction in comparison with those of the most noted wine-producing countries of the world. The long established prejudices in favor of wines which have a foreign trade mark and an unreadable label are not, it is true, entirely removed; it will probably be many years before it will cease to be "fashionable" to give undue credit to wines that are imported, simply because they *are* imported; but the good work in this direction which has been already accomplished by the Urbana Wine Company, of Hammondsport, N. Y., gives promise of a future development of wine making in this country that cannot fail to make the business one of considerable importance among our industries. In foreign wines adulterations, often injurious to health, are so common that it is difficult to obtain a pure article, and many, among those who are not connoisseurs, have never had an opportunity to taste a pure wine. For this reason, more than any other, the establishment of the wine making industry here, in such way that all may assure themselves of the absolute purity of the wine they buy, becomes a matter of particular moment, and the engravings we give on the first page of this paper, illustrative of the location and works of the Urbana Wine Company, will undoubtedly attract the attention which a subject of such direct interest to almost every one deserves.

The first requisite in the making of a superior wine is to have the best quality and fine varieties of rich, ripe grapes. These are not grown to any great extent anywhere in the world except between the 35th and 55th degrees of north latitude. In climates more northerly the grape seldom arrives at full maturity, and the wines are weak, liable to sour, and destitute of the generous flavor which characterizes those produced from grapes grown further south; if we go further south than the 35th degree, however, there is too decided a predominance of the saccharine matter, and a perfect vinous fermentation cannot be effected. The location of the vineyards of the Urbana Wine Company, on the shores of Lake Keuka, or Crooked Lake, Steuben County, N. Y., combines all the advantages of the finest grape-growing regions of the world. The soil is a gravel on calcareous rock; the ground is undulating and even precipitous, with a general southeast exposure toward the lake, which tempers the summer breezes and gives that atmospheric equability best calculated to insure the perfect ripening of the grape. The location has been styled the Rheims of America, and has been famous for its grape production for many years, though it was not until about 1860 that this was made a regular business. Now, however, the vineyards here cover some ten thousand acres, in the heart of which, and immediately on the banks of the lake, affording ready means of cheap transportation, are the works of the Urbana Wine Company.

The principal varieties of grapes cultivated are the Catawba, Isabella, Delaware, Iona, Walter, and Concord, and it is the proper selection and combining of the fermented juices of these grapes, under conditions which are carefully regulated, that makes the various still and sparkling wines for which the company have obtained so wide a reputation. They use absolutely nothing else but these grapes, except the necessary quantity of pure sugar, so that they make no bogus or carbonized wines, the gas in the champagne being a natural product of fermentation in the bottle, and not an artificial gas injected in the wine by a machine, as is the case with some of the wines now made.

Referring to our engraving, the main building of the company's works is a very substantial stone structure, 150 feet long by 60 feet wide, with wings extending on either side, the ground floor of the whole being entirely taken up by capacious vaults, the walls of which are so thick and solid that the temperature there in summer weather never rises above 60°. The grapes, as they are brought in, principally by steamers, sloops, and flatboats from the vineyards on the lake, are first taken to the third story or top floor of the establishment, where they are carefully assorted, and all imperfect or decayed fruit removed. They are then run through mills especially designed for breaking the skins without crushing the seed, and it is the juice derived from this first operation from which the highest quality of champagne is made. From here the grapes go to the press room, an illustration of which may be seen in one of our views. There are several large presses here, where two or three workmen, with powerful leverage, subject the grapes to sufficient pressure to thoroughly extract all the juice, which is conveyed through rubber hose to large casks below, where the first fermentation takes place. For a perfect vinous fermentation the temperature has to be carefully regulated. Below fifty degrees it proceeds very slowly, and above seventy degrees it would be too rapid, with danger of passing into the acetous stage. As the fermentation proceeds the temperature of the liquor rises, it has a turbid appearance, and gives off carbonic acid gas. At length this commotion gradually diminishes, and the liquor recovers its transparency, when it is found to have exchanged its sweet taste for one of considerable pungency, and to have acquired the property of acting as a powerful stimulant on the animal system. After this first fermentation the wine is racked off into other and clean casks to remove from it all sediment or impurities, and it is now in the proper condition to combine in various ways the product of different kinds of grapes for making still wines, or for the subsequent processes necessary to make champagne.

In the selecting of the different grape products which will so blend as to give the best effects as regards spirit, flavor, acidity, etc., both in champagne and still wines, great care and experience are necessary. The proper combination being decided upon, the wine is bottled accordingly, as shown in the "bottling" room. This is done by the aid of an automatic bottle filler, the corks being held by a metallic fastening styled an agraff, always used in first corking, and the filled bottles are then piled up to await the second fermentation. The department in which this takes place should be kept at an even temperature, and for this purpose it is fitted up with steam pipes. The air being of the required warmth causes a second fermentation in the bottle, and this produces the carbonic acid gas which makes the sparkle; absolutely nothing else but this natural product of the grape being used to make the life and effervescence of the wines of the Urbana Company. As the process approaches completion it is marked by the frequent breakage of bottles, which are burst by the gas produced in them by the fermentation, about 5 per cent of all the wine made being lost in this way. In France and other wine-producing countries the natural heat of the atmosphere is depended upon to effect the fermentation, so that when the weather is exceptionally cool during the wine-making months the operation proceeds in a very tardy and uncertain way, while here it goes on as regularly as clockwork, and the results can be definitely calculated upon, although there is no difference in principle between the methods followed by this company and those in use by the best French wine manufacturers.

When the second fermentation has been completed the bottles are lowered into cool vaults, where they are allowed to quietly rest and mature for two years. When wanted for use the bottles are placed on sediment racks, necks downward, workmen passing through and shaking them gently twice a day for three or four weeks. In this way any sediment which has been produced by the fermentation is gradually worked down on the cork in the neck of the bottle. From here the bottles go to the finishing room, which is shown in the large view at the bottom of the page. Here the cork is removed by an expert, and as it flies out carries with it a small quantity of champagne and the sediment which had settled there. It is then passed to a "doser," who, with a small machine, injects a sirup made of white sugar candy dissolved in champagne. The quantity so injected is very small, but care is taken that the contents of each bottle shall be exactly the same. The bottle next goes to the corker, who, with the aid of a machine, closes it with a large cork, after which come the tying and wiring, all of the operations, however, being conducted in much less time than it takes to describe them. The bottle is now well shaken, to mix the sirup thoroughly with the wine, and then comes the labeling, putting on the foil, wrapping, packing, etc.

In the manufacture of sweet and dry Catawba, port, etc., particular care is taken in all the processes and in putting up the wine to make an article which will keep in every climate. The Catawba is a heavy, fine-flavored wine, and to a large extent takes the place of imported hocks. The port wine made by the company is from several varieties of grapes fermented on the skins, which gives it a heavy dark color. One of our sketches gives a view of one of the large vaults, where, in immense casks of about 3,000 gallons capacity each, the still wines are kept until they have been properly matured and mellowed.

The vaults and building of the Urbana Wine Company, originally the largest in this country, were last summer greatly increased, giving to the establishment quite double its former capacity. The entire new vaults, under the new stone south wing, are 80x40, with artificial ice houses behind the lower walls, capable of reducing the temperature if desired. These are wholly devoted to champagne manuture. The fermentation room above them is 80x40, fitted with steam boiler and works, controlling the temperature at any desired point, and is claimed to be the most complete fermenting room in any wine-making establishment in America. The storage capacity for wine was also nearly doubled by the addition of casks. Above this are the new finishing rooms, and on the floor above the store and rooms where grapes are received. These buildings are made of solid stone, with walls of great thickness. The crop last fall was exceptionally prolific and very superior in quality, and the company decided to put in a very large stock. More than twice the amount of grapes ever before purchased were crushed last autumn by this company.

At the late Paris Exhibition the "Gold Seal" and "Gold Seal Extra Dry" champagnes of the Urbana Wine Company were exhibited in direct comparison with the best champagnes of France. This was the first time there had been a real comparison between the champagnes of the different countries, and as a result these wines were awarded a medal. At our Centennial in 1876 the "Gold Seal" and "Gold Seal Extra Dry" were awarded the highest honors, obtaining two medals and two diplomas.

The officers of the company are: D. M. Hildreth, President; Clark Bell, Vice-President; H. H. Cook, Treasurer; and A. Smedberg, Secretary. A. J. Switzer, Hammondsport, N. Y., is the General Superintendent.