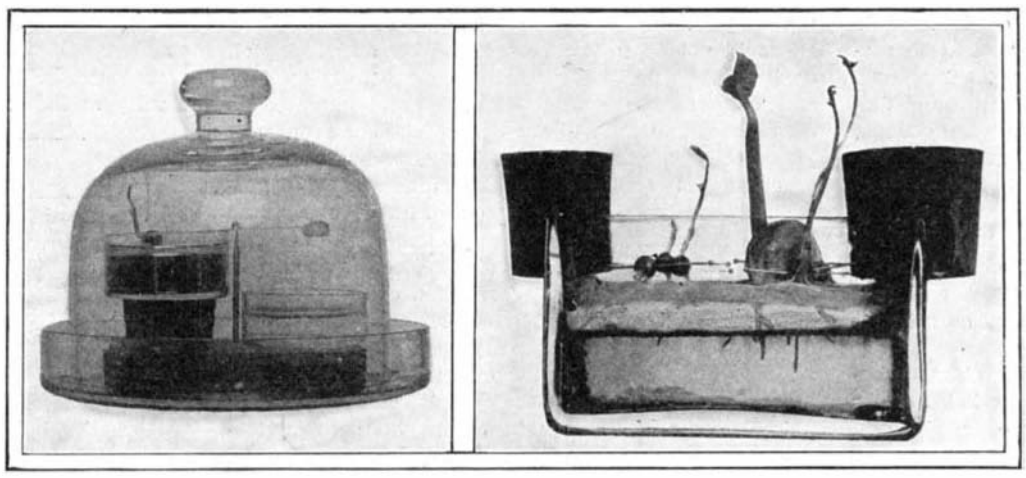
PENETRATION OF MERCURY BY SEED RADICELS.

BY EMILE GUARINI.

Herr Ph. van Harreveld has recently made some curious experiments upon the interesting subject of the penetration of mercury by the radicels of germinating seeds floating upon the metal. The phenomenon has given rise to much controversy and is singularly paradoxical when we take into consideration the great density of mercury as compared with that of a seed. The first mention of this curious prenomenon dates back to 1829, when M. T. Pinot presented to the Academy of Sciences of Paris a memoir upon the subject under consideration. He had caused the germination of seeds floating freely upon mercury, and had seen their radicels penetrate the latter to a greater depth than was compatible with the laws of hydrostatics. Although the weight of the seeds was less than the pressure of the mercury in a contrary direction, the radicels nevertheless penetrated the metal. In order to explain the phenomenon, it was necessary, as was then thought, to have recourse to a particular vital force. Dutrochet repeated the experiment during the same year, but was unsuccessful. Nevertheless, C. Mulder, in 1829, H. R. Goeppert, in 1831, and Poyer, in 1844, confirmed the accuracy of Pinot's observations. In 1845, Durant claimed that the radicels would not penetrate unless the seeds were fixed by a coating composed of mercury and organic substances of the seed soluble in water. In 1854, the phenomenon observed by Pinot was confirmed anew by A. Wigand, but denied in 1860 by Hofmeister and again in 1865 by the celebrated botanist Sachs.

The matter has now been definitely settled by the experiments of Herr van Harreveld, in whose opinion the seed is fixed by the molecular pressure of the water which ascends through capillarity around it. In fact it is necessary always to put a little water upon the mercury in order to keep up the germination of the seeds. The extent of the upward pressure of the mercury and the downward molecular pressure of the water can be calculated approximately. The latter is greater than the difference between the weight of the seed and the pressure of the mercury. Moreover, Herr van Harreveld repeated the experiment of Pinot with a very sensitive scale beam. He balanced the weight of the seed by a small piece of paraffine, both the former and the latter being placed at the ends of the beam. In this case, the molecular pressure alone must have surmounted the upward pressure, since the radicels of the seed employed (that of *Lathyrus odoratus*) penetrated to a depth of nearly three-tenths of an inch. It is possible even to add a weight of a grain and a half to the paraffine before the radicels are made to emerge from the mercury.

According to Herr van Harreveld, MM. Dutrochet, Durand, Hofmeister, and Sachs too lightly refuted the observations of Pinot and Wigand, and MM. Mulder, Goeppert, and Poyer did not really effect a penetration such as was witnessed by Pinot, since they fixed the seeds too slightly. Poyer determined the depth to which the radicels penetrate by putting a stratum of mercury above one of water. The two strata were separated by a platinum grille covered with a piece of tulle. Herr van Harreveld repeated this experiment with a grille of japanned iron and found that the radicels traversed the mercury and penetrated the water.



A NOVEL EXPERIMENT SHOWING THE PENETRATION OF MERCURY BY SEED RADICELS.

ERECTING THE COLUMNS FOR THE CHOIR OF THE CATHEDRAL OF ST. JOHN THE DIVINE.

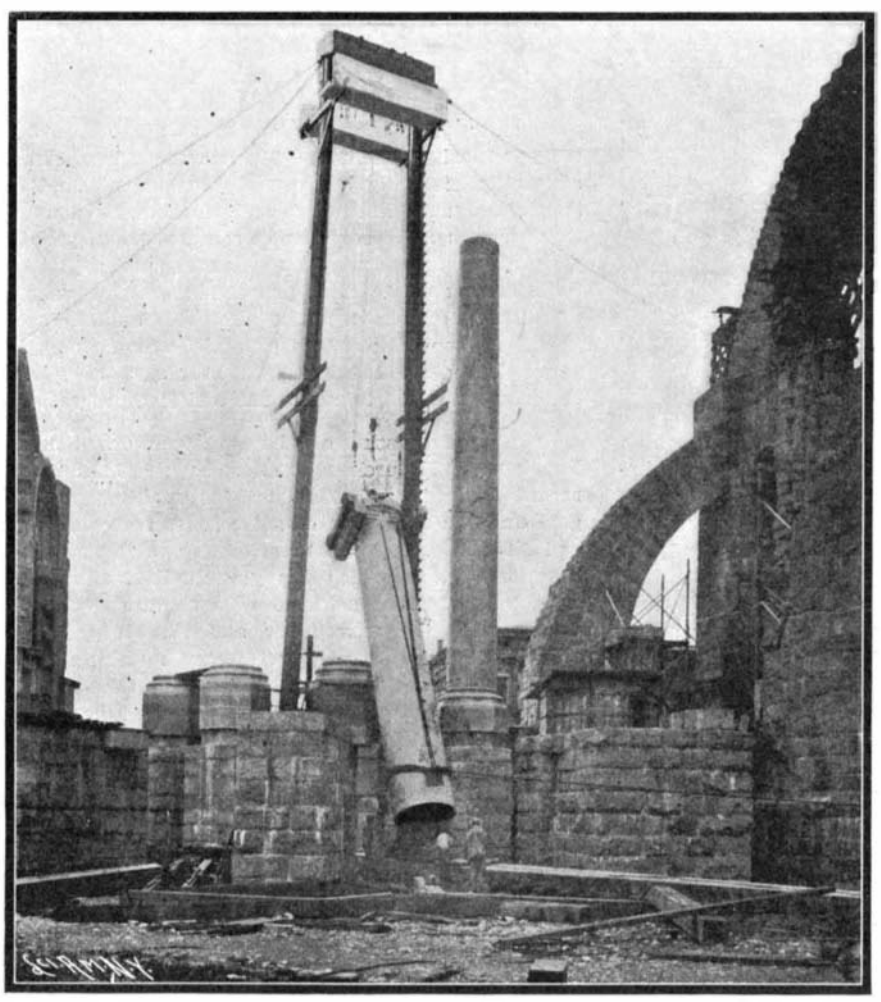
On the third of October of last year the SCIENTIFIC AMERICAN published a brief description of the manner in which the huge sections of the columns for the choir of the Cathedral of St. John the Divine, Morningside Heights, New York city, were transported from the wharf, where they were landed from a lighter, to the scene of operations. These huge columns were originally intended to be monolithic, and it will be remembered that several enormous lathes were specially built to turn them. However, this could not be successfully accomplished, as the 55-foot columns broke during the polishing operation, one when it was within a few hours of completion. They were therefore made in two sections, one 37 feet 6 inches long and weighing 90 tons, and the other 17 feet long, weighing between 40 and 45 tons. At the present five of the columns have been erected and the remaining three will be in position within a few months. The photographs illustrate the method employed in doing this.

The larger section, as it comes from the Vinalhaven, Me., quarries, is somewhat longer than necessary, and its upper end is roughly shaped into a cap with a flange about a foot thick which projects some three inches beyond the surface of the column proper. To raise this section and place it upon the base intended for it, a huge clamp made of great timbers bolted together is placed around the stone just below the flange left for that purpose and is drawn tight by means of long, heavy bolts. The lower pulleys employed are hooked into shackles bolted to the timbers. The first illustration clearly shows this wooden clamp and the long iron bolts used to tighten it around the column. By means of a steam drill two holes are made in the lower end of the stone into which two iron pins, some 4 or 5 inches in diameter, fit loosely. These pins rest on a shoe built of heavy timbers which is moved along on rollers as that end of the column advances with the gradual rise of the upper end. When the lower end also is about to leave the ground the pins drop out, a retaining cable preventing the stone from swinging against the base or other stonework. When the larger section is fixed in place, stone-masons cut away the rough cap, leaving that part of the column of the right length and ready for the superposition of the smaller section. This is raised in a similar manner, but instead of using the wooden clamp—the stone being already cut to its proper length—a lewis is employed, and only one pin is inserted in the lower end. The hoisting is done by a powerful winch drawing steam from a stationary donkey boiler and the boiler of a 40-horse-power traction engine.

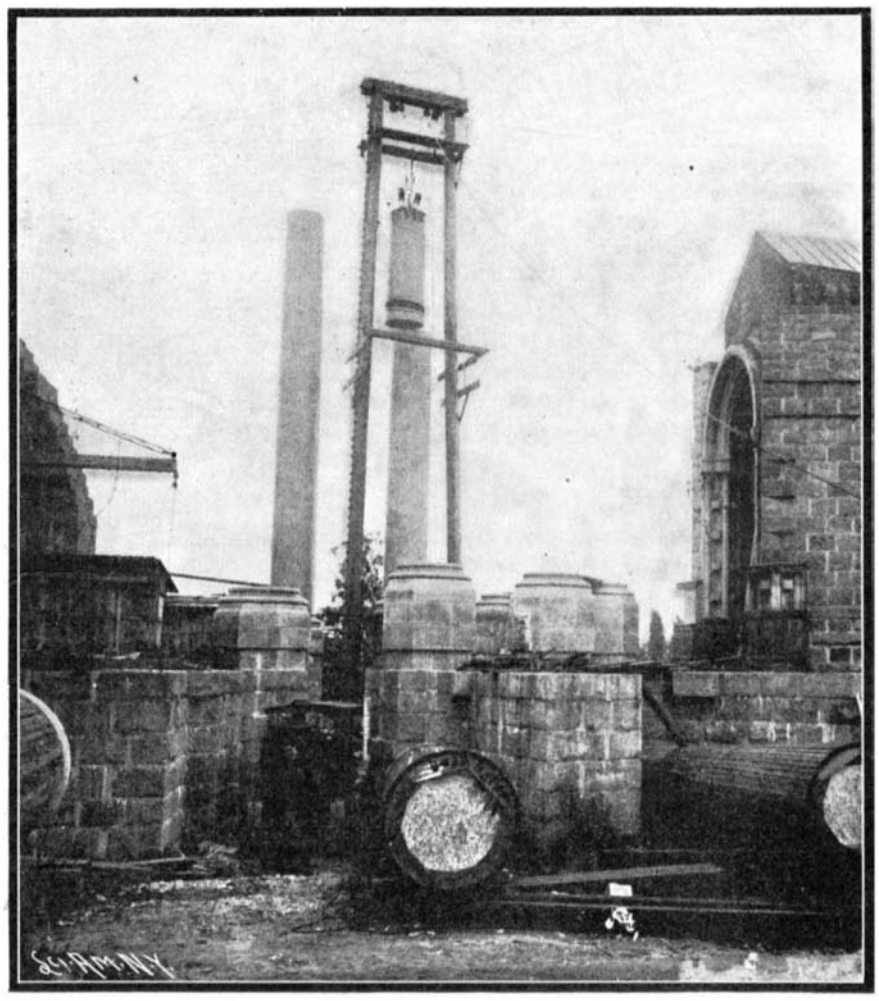
The derrick itself consists mainly of two 96-foot timber uprights tapering from 20 to 24 inches in diameter. While hoisting one of these huge stones these timbers seem perilously light, but as a matter of fact they will with safety bear nearly double this load. When the derrick is to be moved from one position to another two powerful jacks lift it slightly from the ground, the flooring surrounding the column base—of 10 x 10 timbers—is soaped, and the derrick is easily moved, little by little, the guy ropes being slackened or tightened as necessary.

International Automobile Show in Berlin.

An international automobile show is to be held at Berlin, under the patronage of the German Automobile Club, in connection with the Chamber of Automobile Industry. It will last from the 4th to the 19th of February next. Prince Henry of Prussia is to have the nominal patronage of the affair, and the organization committee is formed of the Duke of Ratibor, Baron von Brandenstein, Gen. Becker, and others of equal prominence.



Raising the Lower Section of the Column. The End About to Leave the Shoe.



Lowering the Upper and Smaller Section Upon the Lower One.

ERECTING THE HUGE COLUMNS FOR THE CHOIR OF THE CATHEDRAL OF ST. JOHN THE DIVINE.