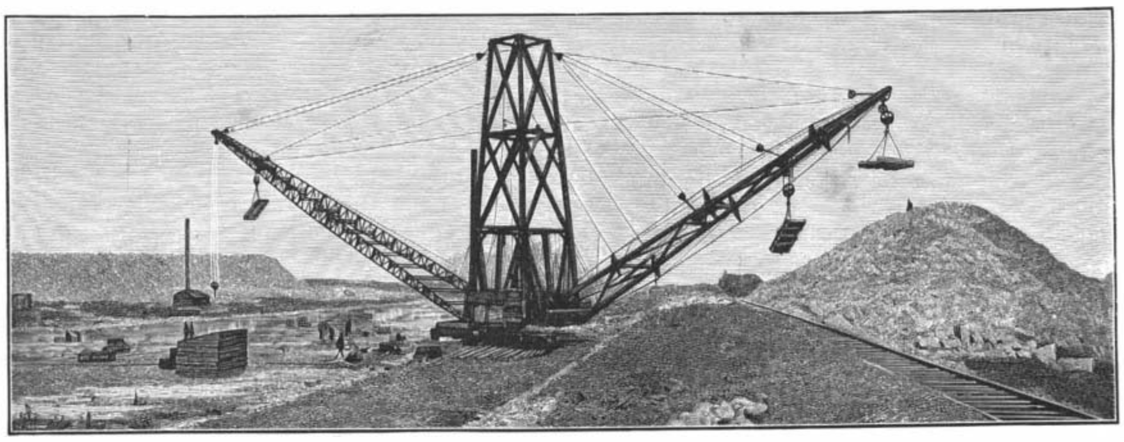
TWO ARM DERRICK—CHICAGO DRAINAGE CANAL.

Our engraving illustrates one of the high power two armed derricks now at work on section 14 of the great Drainage Canal of Chicago. The great radius of the arms facilitates the removal and deposit of the debris in a most economical manner.

The two arms of each derrick are of different lengths, one being long enough to handle skips clear across the channel and the other one shorter and equipped for handling them on the side nearest the point where the derrick stands. Each arm carries two skips, and while one is over the ditch picking up two skips the other is over the spoil bank dumping two.



TWO ARM DERRICK—CHICAGO DRAINAGE CANAL.

The Highest Bridge.

The highest bridge of any kind in the world is said to be the Loe River viaduct, on the Antofagasta Railway, in Bolivia, South America. The place where this highest railway structure has been erected is over the Melo rapids in the Upper Andes, and between the two sides of a canon, which is situated 10,000 ft. above the level of the Pacific. Counting from the surface of the stream to the level of the rails, this celebrated bridge is exactly 636½ ft. in height. The length of the principal span is 80 ft., and the distance between abutments (total length of bridge) is 802 ft. The largest column is 314 ft. 2 in. long, and the batter of the pier, what is known to bridge builders as "one in three." The gauge of the road is 2 ft. 6 in., and trains cross the bridge at a speed of 30 miles an hour.

PORTABLE STONE DRESSING MACHINE OF THE AMERICAN PNEUMATIC TOOL COMPANY.

Some years ago we illustrated and described the MacCoy pneumatic tool, of the American Pneumatic Tool Company, of this city. At that time it was attracting much interest from a scientific standpoint, as well as from its extensive application in industrial work. Its uses have been varied and extended, and the stone worker and boiler maker both find it an indispensable adjunct in carrying out their work. The tool proper is virtually a little steam engine, which of course can be worked by compressed air. Within a cylinder is a piston which by the action of the steam or compressed air is made to reciprocate back and forth with very great rapidity. On the up stroke it cushions against steam or air, but on the down stroke it strikes against the head of a cutting bit, chisel or other appliance introduced into a socket in the lower end, and pressed upward by a spring. The chisel or other tool carried by it will receive several thousand blows in the course of a minute.

The distinctive peculiarity of the mechanism is that the cutting tool proper is not moved, but can be held constantly against the work while subject to the impacts of the reciprocating piston. On account of this distinctive action the pneumatic tool can be held in the hand against a surface and will operate thereon without any other abutment. It is startling to see great flakes of stone pared off by its action and stubborn material yielding to it as readily as wood to the action of a hatchet. A two inch chisel will cut flakes half as large as the hand in brown stone. For delicate work it is unexcelled; marble can be carved by it, the material shaping itself under the action of the tool, almost as if the design were being modeled from clay.

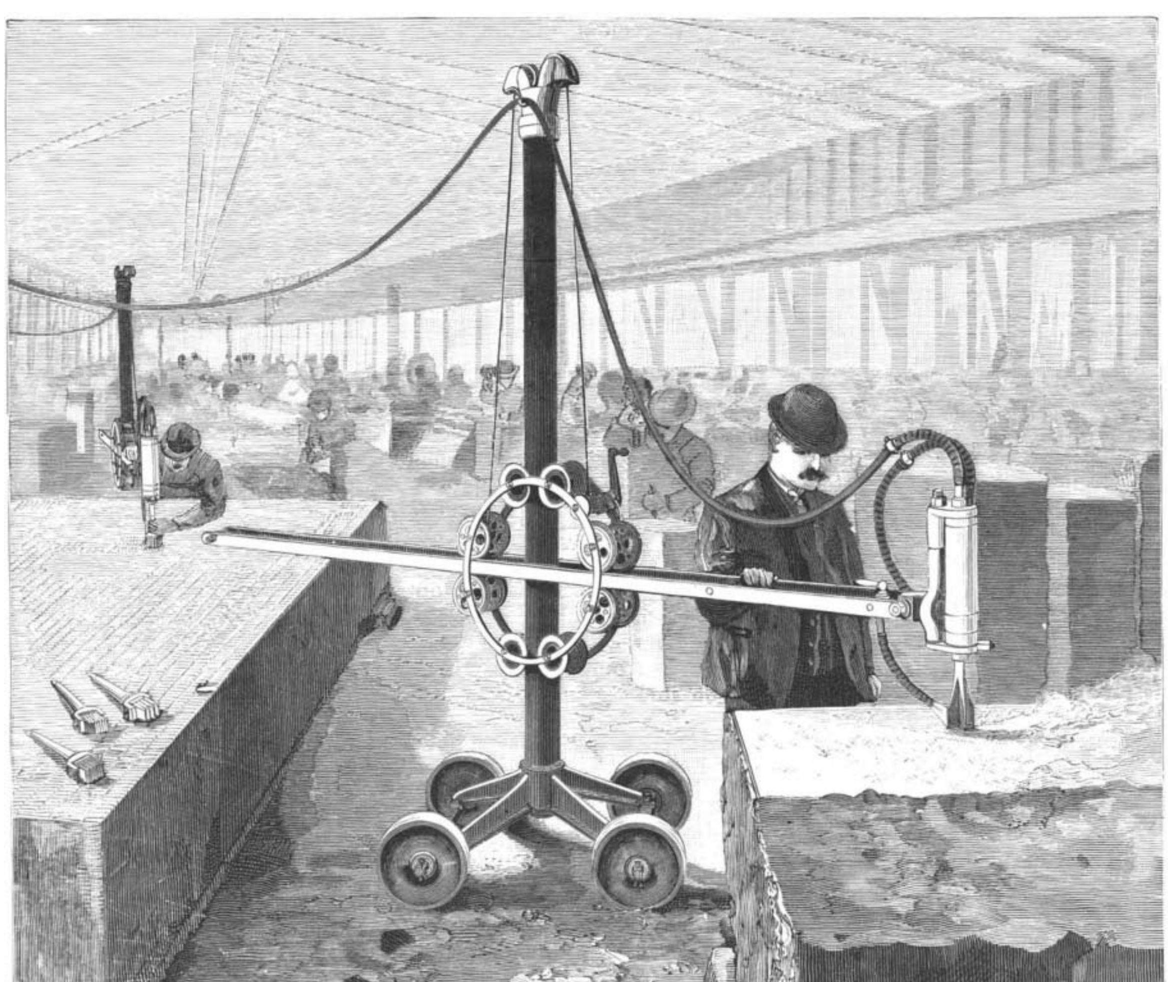
In our present issue we illustrate one of the last improvements introduced by the American Pneumatic Tool Company, of 844 Washington Street, New York City, the new portable stone dressing machine. This machine is designed for use on the hardest granite for working it to a surface. It takes the stone rough pointed, about an inch above the final surface level. It quickly brings the granite to a readiness for a polish by the use of a cross chisel, and for 4, 6, 8, 10 and 12 cut surface, bush hammers corresponding to hand hammers are used.

Upon a base carried on wheels, so as to be capable of movement when it is desired, is mounted a vertical hollow column. A carriage with guide rollers is arranged to move up and down this column, and this carriage sustains a horizontal carrier bar, which can slide freely back and forth, to one of whose ends the pneumatic tool is fastened. A partial counterpoise for the weight of the carriage, carrier bar and tool moves up and down within the column and is attached by wire ropes to the carriage, and for adjusting the play of the counterpoise to provide for different elevations of the carrier bar, there is a windlass on the carriage. The carrier bar is double and runs on four pairs of rollers, and by sliding it in and out and swinging its end laterally, the tool can be moved in any desired direction in a horizontal plane. The action of the mechanism is obvious. The stone to be operated on is placed in about the position required to work it by hand; the stone dressing machine is moved to any convenient place near the stone (or the stone to the machine), the play of the counterpoise is adjusted for the height of the surface to be operated on, and the tool started. The hard granite at once succumbs, and in a very short space of time the surface begins to take shape, and in a few minutes a superficial foot can be dressed. The exhaust of the tool is caused to maintain a blast against the point of the tool to blow away the chips and dust.

In the foreground of the picture the machine is shown operating a cross chisel, while fine bushing is shown in progress in the background, the operator holding the tool in his hands so as to regulate its work.

Allowing for wages, repairs, and fuel, it is estimated that the machine can be run for a cent a minute. From actual operation of the machine it is found that six to ten minutes is a fair average for work upon one superficial foot, and a saving of thirty cents per foot over hand labor on the basis of Quincy prices is found to be effected. On the work of a single machine this is a daily saving of $18, an annual saving of over $5,000. Owing to the more uniform cutting of the machine, from ten to twenty cents a foot additional is saved in the polishing, and the blacksmithing also costs less. As the machine produces no stuns, the quality of the cut work is very superior.

Another most important point is that it combines the skill of the workman with the efficiency of machinery. The stone need not be level, for by setting the tool properly and by ordinary attention on the part of the workman, it can be brought to a perfect surface.



PORTABLE STONE DRESSING MACHINE OF THE AMERICAN PNEUMATIC TOOL COMPANY.

A New Emerald Mine.

Mr. Geo. F. Kunz, writing to the American Journal of Science, says: In July, 1894, a new locality of true emeralds was discovered by Mr. J. L. Rorison, miner of mica, and Mr. D. A. Bowman, on the Rorison property, near Bakersville, Mitchell County, N. C. Here, at an elevation of five thousand feet a. t., on Big Crab Tree Mountain, occurs a vein of pegmatite some five feet wide, with well defined walls, in mica schist. This vein carries a variety of minerals besides its component quartz and feldspar, among these being garnets; translucent, reddish, and black tourmalines, the latter abundant in slender crystals; white, yellow, and pale green beryls; and the emeralds. These latter are chiefly small, 1 to 10 mm. wide by 5 to 25 mm. long, but some have been found two or three times larger than the larger size named. They are perfect hexagonal prisms, generally well terminated, and are clear and of good color, with some promise for gems. They very strikingly resemble the Norwegian emeralds from Arendal.

One vein outcrops for perhaps a hundred yards, with a north to south strike. The results thus far obtained are only from about five feet depth of working, so that much more may be looked for as the vein is developed.

The locality is fourteen miles south of Bakersville, and about the same distance from Mitchell's Peak, a little north of the crest of the Blue Ridge. It is some fifty miles west of the emerald locality at Stony Point, Alexander County, N. C., described by William Hidden, in 1881, in a pamphlet privately printed at New York, and in the Transactions of the New York Academy of Sciences, 1882, pp. 101-105, as also by the writer in "Gems and Precious Stones of North America," New York, 1888, p. 91.

I am indebted to Messrs. Rorison and Bowman for the information contained in this paper and for the privilege of examining the specimens found by them.

Lick Observatory.

In reply to a correspondent who asked, In a large observatory, such as the Lick, how are expenses met? Popular Astronomy replies as follows:

Of the $700,000 left by Mr. James Lick, for the erection of the Lick Observatory, more than $575,000 was used in preparing the site, erecting the buildings, and securing the astronomical instruments for the observatory. So that of the large gift bestowed, less than $125,000 remained for the support of the observatory after its completion. The observatory belongs to the University of the State of California, and we understand that the State pays all running expenses and has control of endowment funds through university officers. Professor Holden estimates the annual expenses of the observatory at $20,000.