THE GREAT CHIMNEY AT THE CLARK THREAD WORKS, KEARNEY, N. J., HEIGHT 335 FEET.

We illustrate in this issue the great chimney recently erected at Kearney, near Newark, N. J., by the Clark Thread Co. It possesses the distinction of being the tallest chimney in America, and the fourth tallest in the world. It is the highest chimney ever built for boiler furnaces. The others that surpass it in altitude were erected for carrying off the products of chemical processes and for distributing the noxious gases produced.

The chimney stands in a quadrangle surrounded by the mill buildings of the new thread works and by the engine houses and present factory. It presents a most graceful appearance, and for the traveler passing through Newark, it forms an impressive feature of the scene. The ground on which it stands is on the eastern bank of the Passaic River, a rather low, flat area, so that the chimney bears somewhat the same relation to Newark that the Washington monument does to Washington. The latter structure is the only one in America that can dwarf it.

The shaft is circular and rises with a perfectly uniform batter from the bottom to the neck below the cap. Its diameter at the base is 28 feet 6 inches, and at the neck is 14 feet. This gives a batter of 7 feet 3 inches, or 2·85 inches for every ten feet. Its total height is 335 feet. Its internal diameter is 11 feet, giving one circular flue. At the summit it expands into a well proportioned capital surmounted by a cast iron coping. The latter weighs six tons, and is composed of thirty-two sections. They are bolted together by inside flanges, so as to present a smooth exterior.

The foundation is in concrete. The ground was excavated until a layer of firm gravel was reached, one foot below the water. Upon this the concrete was deposited. It was composed of crushed limestone 6 parts, sand 3 parts, and German Portland cement 1 part. It is 40 feet square and 5 feet deep, forming a block of 8,000 cubic feet volume, and weighing about one million pounds.

On this the base was started, composed, like the shaft proper, of brick laid in cement mortar. For this portion, up to four feet above the ground, a mixture of 1½ parts sand to 1 part German Portland cement was used for the mortar. The shaft up to a height of 160 feet is laid with the following mixture: Sand 6 parts, lime 2 parts, and cement 1 part. The sand and lime were made into mortar and had stood three months before use. This method of treatment is considered to improve the quality of mortar. Just before use the cement was added. From this point up the proportion of cement was increased until, at the top, the proportions became: Sand 3 parts, lime 1 part, and cement 1 part.

Two qualities of brick were used. The outer portions were of the first quality North River, and the backing up was of good quality New Jersey brick.

Every twenty feet in vertical measurement an iron ring, 4 in. wide and ¾ to ½ inch thick, placed edgewise, was built into the walls, about 8 inches from the outer circle.

As it starts from the base the chimney is double. The outer wall is 5 feet 2 inches in thickness, and inside of this is a second wall 20 inches thick and spaced off about 20 inches from main wall, and, of course, concentric with it. From the interior surface of the main wall eight buttresses are carried, nearly touching this inner or main flue wall, in order to keep it in line should it sag. The interior wall, starting with the thickness described, is gradually reduced until a height of about ninety feet is reached, when it is diminished to 8 inches. At 165 feet it ceases, and the rest of the chimney is without lining; no fire bricks are used in the lining.

As the chimney receives two horizontal flues placed diametrically opposite to each other, a 12 inch deflecting wall is built across the vertical shaft, starting from the base and rising 16 feet. The plane of this wall is perpendicular to the axis of the flues.

The two flues just alluded to are arched tunnels 7 feet wide and 8 feet high. An arched opening is formed for their entrance into the chimney, and a space of two inches is provided between the outside of the flue and the main structure. The walls of the horizontal flue as they enter the stack are 16 inches in thickness.

In these flues it is proposed to place feed water heaters for the boilers. About one thousand pipes will be included in them. It is believed that much more of the waste heat can thus be economized than is usual, as, owing to the great height of the chimney, a comparatively slight heat in the products of combustion will generate ample draught. The advantage, in an engineering sense, of so large a chimney will be derived from this factor of economy.

Twenty-one boilers of 200 H. P. each will depend upon the great chimney.

The general methods of construction adopted were characterized by simplicity as well as by efficiency. A steam elevator, with a platform 3 feet 6 inches by 3 feet, was arranged to run up and down inside the shaft. It had 3,000 lb. capacity, but never had to raise more than 800 lb. Two uprights, 4 × 6 inches, were braced against the inside walls and served as guides to the elevator. As the work progressed these and other fixtures of the elevator were carried up until finally the crane, carrying the main sheave, was above the coping nearly 340 feet from the earth. Interior scaffolds were built every few feet as the work progressed; two beams, 3 × 8 inches, being built into the walls to carry each one.

The greater part of the main shaft and lining was executed by eight bricklayers and five helpers. Their material was supplied from below by seven laborers on the ground. A system of bell and flag signals was arranged, so that no confusion could exist, and the men below could tell at once what material to send up in the elevator.

Two operations were needed to keep the chimney true. The circle had constantly to be verified or trained. By accurate plumbing a series of center points were carried up, one being established at every forty feet of height. From the line of those representing the axis of the shaft the training was done. The other operation was the plumbing. The batter or slope being a constant, a mason's plumb rule was planed off to give the true slope, and the sides were constantly tried with this. Both these operations were in charge of one man, who constantly was training or plumbing. By many hours of practice he acquired the art so perfectly that he never looked to the ground, his eye not ranging below the end of his rule.

Eventually the chimney was plumbed from a height of 300 feet, a forty-foot plumb bob being used. The deviation from the vertical was practically imperceptible.

The foundation, base, and 18 feet of the shaft were built in December, 1887. The work was then closed in for the winter. Operations were resumed in April, 1888, and continued when the weather permitted. The brick work was completed in September. Altogether 150 days of 9 hours each had been devoted to the construction—a remarkably short period for so great a work.

The total weight of the chimney is put at 5,000 tons, divided as follows:

Brickwork	9,051,899	lb.
Concrete	1,000,000	"
Ironwork	40,000	"
Total	10,091,899	lb.

The bearing surface is 1,600 square feet, giving about 2·8 gross tons per square foot, or more exactly 6,312 lb. The total number of bricks in the stack is 1,697,231; 201,000 were used in the base and foundation, and 66,277 in the caps.

No means are provided for ascending the chimney after the elevator is removed. Should it become necessary to do so, a balloon, with a line, can be sent up through the central flue and allowed to lose its gas and descend on the outside. This will provide means for drawing up a line of sufficient size to enable a man to ascend the shaft.

We append some dimensions of the three chimneys that exceed this one in height:

Townsend's Chimney, Glasgow, Scotland.

Height from ground to coping	454 feet.	
Outside diameter, at ground	32 "	
" " " top	13 "	4 inches.
Thickness of wall at base	5 "	7 "
Cost	£8,000.	

Tennant & Co.'s Chimney, Glasgow, Scotland.

Height from ground to coping	435 feet	6 inches.
Outside diameter, at ground	40 "	
" " " top	13 "	6 "

Dobson & Barlow's Chimney, Bolton, England.

Height from ground to coping	367 feet	6 inches.
Octagonal in section.		
Outside diameter, at base	33 "	10 "
" " " top	13 "	2 "
Cost	£3,000.	

Over three years were devoted to the building of the Townsend chimney. Tennant & Co.'s was built in one year.

The Clark chimney was erected by the company, under the superintendence of their foreman, Mr. Cunningham. It cost $30,000. From the point of view of architectural beauty, as well as perfection of structural features, too much credit cannot be awarded to all concerned in its erection. It is of interest to note that no workman was injured in any way during the progress of the work. A good idea of the general view of the surrounding country as seen from the top of the chimney may be had from the engraving at the right of the page. This represents the appearance of the chimney when the sketch was made, about two weeks ago, and it will be noticed that the iron hood shown in other views of the completed chimney had not yet been mounted in position. The chimney at this point is 20 feet in diameter, and the platform is so roomy that, in spite of the enormous height, an inexperienced visitor even is likely to experience no sense of giddiness, save, perhaps, from the slight swaying motion that is noticeable when the wind is blowing. The builders have allowed for about six inches of sway, which is about the amount of motion anticipated during a violent blow.

Correspondence.

Dangers of the Emery Wheel.

To the Editor of the Scientific American:

Noting the paragraph in your issue of September 15 regarding "Dangers of the Emery Wheel," we think you might do good service to your large circle of readers, many of whom doubtless use emery wheels, by calling attention to the facts of this case (or a supposed similar one), showing the dangers resulting from ignorance and recklessness. In this case, young Dunwald, who seems to have been more than usually intelligent, was trusted to buy his emery wheel, selecting the size he chose for the machine, put on one much too heavy, and running at a speed which subjected the wheel to a strain of more than twice that of the speed at which it was marked by the manufacturer as proper to be run, evidently not understanding that the "centrifugal strain increases as the square of the velocity." For this ignorance he has paid a severe penalty.

In an experience of some twenty years in the emery wheel business we have seen a great many instances of this kind; in fact, have never found but one or two instances of broken wheels that could not be traced directly to carelessness or misuse. Other causes besides too high speed are as follows: Forcing wheels on the arbor; too small flanges, which should be at least one-third of diameter of wheel; one flange smaller than the other, the large one being concave; neglecting to put an elastic washer between flanges; screwing up flanges too tight, thereby straining the wheel; allowing emery wheel to get out of true; the arbor running loose in the bearings; letting work get caught between the wheel and rest, etc.

The matter of speed is the most serious one, and we have been amazed at the reckless use in this respect. We often find parties running wheels at even double regular speed or four times regular strain. Our only wonder is that so few accidents happen. We would say that we think nearly all manufacturers test their wheels at least three times regular strain, and therefore consider themselves free from blame, and assume that the user is responsible for breaking. H. P. H.

Waltham, Mass., Sept. 15, 1888.

AN IMPROVED AUGER.

The auger illustrated herewith, which has been patented by Mr. Harry W. Richards, of Eden, Fla., has lateral cutters at the upper end of the spiral, and integral therewith, in the same vertical plane with the outer edge of the spiral. When a hole has been bored, the turning of the auger is continued, the cutters keeping clear of the hole until they come to the rough edge at the bottom of the hole, where a single turn causes the cutters to clean the rough edge.

Old Wooden Water Pipes.

At a recent meeting of the Newcastle Society of Antiquaries, one of the members presented some pieces of wooden pipes that were recently discovered in the Side, while some new telephone lines were being laid. They were made of elm, and illustrated two methods of joining pipes. There was, in one method, a butt joint, which was made water tight by an iron ferrule. There was also the spigot and faucet principle, a pointed end fitting into a cup-shaped socket, fastened with a pin. It was mentioned at the meeting that in 1698 an act was obtained to supply the town with water, and four-inch pipes were put down from the Town Moor and across to Gateshead. It was believed by some that these were part of the water pipes used.

A Railroad Racing Dog.

James Griffin, of Danbury, Conn., has a small terrier dog that is surprising the people of his town by his abilities as a runner. Every evening during the summer, when the 6:45 train from the West blew its whistle a few rods from the Main Street crossing, the dog would bound out of the house near by and take the track ahead of the train for the station, half a mile away. The train crosses Main Street at the rate of fifteen miles an hour, and between the crossing and the station is a trestle about 300 feet long. Over this the dog flies, always keeping just so far ahead of the train, slackening his speed as the air brakes are applied, and coming into the station at the same distance ahead of the train as he took when he started the race. Once or twice the engineer has put on steam to try and overtake the dog, but he has not yet succeeded in doing it. The dog never looks back, never barks, and never pays any attention to the calls of his master. When he reaches the station he looks up at the engineer, gives two or three short yelps, and quietly trots home up the track. This performance is repeated with unfailing regularity, and if an effort is made to keep him in the house at train time, he raises an unearthly yelping. It is the custom now for crowds to gather to see the exhibition racing.—*N. Y. Sun.*