capacity of 6¾ tons, and carries 3,857 gallons of water, and is fitted with a water scoop. The weight of the tender loaded is 80,000 pounds. The engine is fitted with the Westinghouse air brake, and the engine and brake are fitted with the Westinghouse air signal. The locomotive was three months in building, and cost in the neighborhood of $12,000.

This new engine differs in outward appearance from those previously built. No brasswork is visible. The ironwork is well finished and polished. The pipes are nickel-plated and the painted portions are striped with silver leaf. A round headlight is mounted over the smokestack.

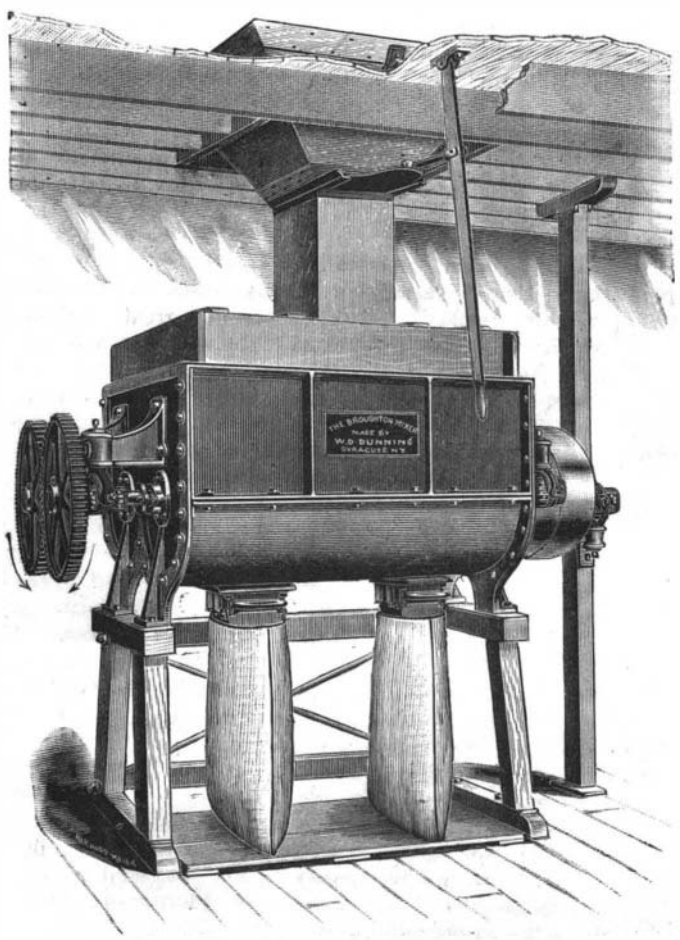
The main dimensions of the engine are tabulated below:

Cylinders	19 in. × 24 in.
Diameter of driving wheels outside of tires	86 in.
Diameter of engine truck wheels	40 in.
Springs, length of driver, center to center of hangers	44 in.
Total length of boiler	26 ft. 4⅛ in.
Diameter of first ring outside	58 in.
Size of firebox	108¾ in. × 40⅞ in.
Tubes, 268	2 in. dia., 12 ft. long.
Heating surface in tubes	1,697·45 sq. ft.
Heating surface in firebox	232·92 sq. ft.
Total heating surface	1,930·37 sq. ft.
Grate surface	30·7 sq. ft.
Stack, inside diameter	15¼ in.
Weight, in working order	124,000 lb.
Weight, on drivers	84,000 lb.
Driving wheel base	8 ft. 6 in.
Weight of tender loaded	80,000 lb.
Total weight of engine and tender	204,000 lb.
Extreme length of engine	39 ft., 6¾ in.
Extreme height from top of rails to top of stack	14 ft., 10 in.

This engine is designed to draw the Empire State Express. On its way to the Chicago Exhibition it easily made a speed of 86¾ miles per hour, and the designers and builders believe that after it has worn enough to smooth up its bearings it will create a sensation in the matter of speed.

THE BROUGHTON QUICK DELIVERY MIXER.

A machine for thoroughly mixing hair and fiber with plaster, and one which can be easily taken care of and quickly set up and operated by any ordinary workman, is shown in the accompanying illustration. The machine is made by W. D. Dunning, of Syracuse, N. Y., and the design is the perfected result of a long experience and practical knowledge of what is required in a plaster mill. All the working parts and mixing chamber are of iron and steel, making the machine solid and durable. It has two shafts running horizontally side by side, geared to run in opposite directions; they are run through a cast iron case circling at the bottom, so that the paddles placed on the shaft in screw form lift the material from the bottom of the case and throw it in opposite directions from one end of the case to the other, thereby keeping it in constant motion and obtaining a perfect mixing. All bearings run in self-oiling boxes outside of the case, so that the material does not come in contact with them. The mixer is provided with two openings in front with slides or gates to let the material out of the machine, and to each of these openings is attached an automatic bag holder. The delivery is very rapid, the discharge from one opening being as fast as one man can take the bags away. The wooden hopper to receive charge passes through the floor above; attached is a cast iron slide arrangement to let material through the spout to mixing chamber, operated by means of a lever within reach of the operator on the ground floor. The machine is provided with two 24 × 8 fast and loose pulleys and should run 175 revolutions per minute; it requires about 4 × 6 feet floor space and has a capacity of 300 barrels per day of 10 hours.



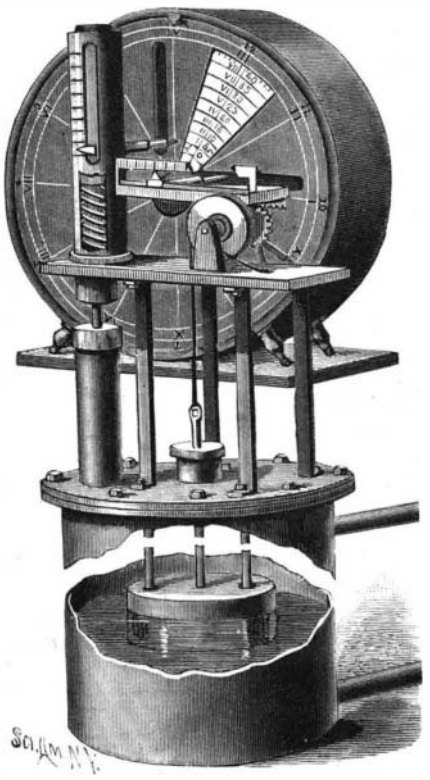
THE BROUGHTON QUICK DELIVERY MIXER.

The Conquests of Modern Science.

Surely I have established my thesis that dirt is only matter in a wrong place. Chemistry, like a thrifty housewife, economizes every scrap. The horse shoe nails dropped in the streets are carefully collected, and reappear as swords and guns. The main ingredient of the ink with which I now write was probably once the broken hoop of an old beer barrel. The chippings of the traveling tinker are mixed with the parings of horses' hoofs and the worst kinds of woolen rags, and these are worked up into an exquisite blue dye, which graces the dress of courtly dames. The dregs of port wine, carefully decanted by the toper, are taken in the morning as seidlitz powder to remove the effect of the debauch. The offal of the streets and the wastings of coal gas reappear carefully preserved in the lady's smelling bottle, or are used by her to flavor blanc-manges for her friends. All thrift of material is an imitation of the economy of nature, which allows no waste. Everything has its destined place in the process of the universe, in which there is not a blade of grass or even a microbe too much, if we possessed the knowledge to apply them to their fitting purposes.—*North American Review.*

A STEAM PRESSURE AND WATER LEVEL RECORDER.

With the device shown in the illustration a single steam gauge or water gauge for a boiler is not required, the steam pressure and the height of the water being indicated at sight, indicator diagrams being also furnished of both, by which the owner may see whether the boiler and the furnace fires have had proper attention.


LEWIS' STEAM PRESSURE AND WATER LEVEL RECORDER.

The improvement has been patented by Mr. William M. Lewis, of Thurber, Texas. At the front of the boiler is a closed vessel connected by pipes with the steam and water spaces, and having on its top a cylinder, in which is a piston with a rod extending upward in a casing on which graduations are marked. Around the upper end of the rod is a coiled spring, insuring a return movement of the piston with diminishing steam pressure, and the rod has in front a pointer indicating on the graduations, while from its rear a spring-pressed pencil extends through a slot in a clockwork casing. The dial, which is revolved by the clockwork, has near its outer edge a double graduation, one in Roman and the other in Arabic numerals, and a pointer fixed on the casing at the top indicates the time of day as the dial revolves. As the pointer indicates the steam pressure to the sight, the pencil marks a corresponding line on the moving dial. In the closed vessel at the front of the boiler is also a float, from which extends upwardly a rod connected with a belt passing over a wheel rotated by a spring, to correspond with the rise and fall of the float. On the shaft of this wheel is a gear meshing into a rack operating a horizontal slide, on the casing of which is a graduation, the rear portion of the slide also carrying a spring-pressed pencil traveling in a horizontal line on the dial. An indicator made in the shape of a sector corresponding to one of the divisions of the dial is hung loosely on the shaft of the latter, the indicator having two sets of graduations corresponding to those of the horizontal and vertical scales, one indicating the height of water in the boiler and the other the steam pressure. By placing this indicator in proper position on the dial, it will indicate the steam pressure and height of water in the boiler at any particular time. The dial is preferably of slate, so that the markings may be easily wiped off, and, by using different colored pencils, as red and blue, a red line may represent the steam pressure and a blue line the water level, or *vice versa.*

Rock Emery Millstones.

Probably few of our readers have ever seen rock emery, and fewer still have heard of millstones made of this hardest of all stones except the diamond. But rock emery millstones are now made, and a long step has thus been taken toward pulverizing cheaply many hard substances that have heretofore only been reduced at much expense of wear and tear, and by slow and tedious processes. Rock emery is not a common mineral, being found only in a few countries. The best comes from Greece, but the larger importations are from Turkish mines. The consumption of emery is large, and its use has become of great importance in many industries, as it easily grinds away all substances with unexampled rapidity. A pure emery face never glazes, but is always sharp and cutting.

Rock emery mills reduce at once the hardest rocks or the softer substances, grinding all to any degree of fineness. Heat does emery no harm, and one of the remarkable properties of the emery stones is their ability to run cool. They form the most rapid grinder known, and are as much more durable than other millstones as they surpass them in hardness. The emery millstone face is never dressed, a little work on the furrows, and eye (made of softer material), is all the sharpening it requires. Those stones are made to take the place of all other millstones, without any changes in the mill, and wherever other stones are used the rock emery millstones will do better work at less expense, and last much longer. They also grind hard materials that soon destroy all softer millstones. The hardest buhr, compared with emery, is like cheese.

Now that the manufacture of the patent rock emery millstones is understood they are turned out for all sorts of mills and for all purposes, at a moderate price, and wherever known are recognized as wonderful grinders, especially for fine work, from 60 to 150 mesh. These rock emery millstones are ample proof, if any is needed, of the progress of American milling.

A Colored Man's Career.

Frederick Douglass, ex-minister to Haiti, has been negotiating with the owner for the purchase of the Villa, one of the most valuable and beautiful estates in Talbot County, Maryland. Mr. Douglass is a native of Talbot County, where he was born a slave. In addressing an audience at the colored school at Easton, Md., recently, Mr. Douglass said: "I once knew a little colored boy whose mother and father died when he was but six years old. He was a slave and had no one to care for him. He slept on a dirt floor in a hovel, and in cold weather would crawl into a meal bag head foremost and leave his feet in the ashes to keep them warm.

"That boy did not wear pants like you do, but a tow linen shirt. Schools were unknown to him, and he learned to spell from an old Webster's spelling book and to read and write from posters on cellar and barn doors, while boys and men would help him. He would then preach and speak, and soon became well known. He became presidential elector, United States marshal, United States recorder, United States diplomat, and accumulated some wealth. He wore broadcloth and didn't have to divide crumbs with the dogs under the table. That boy was Frederick Douglass.

"What was possible for me is possible for you. Don't think because you are colored you can't accomplish anything. Strive earnestly to add to your knowledge. So long as you remain in ignorance, so long will you fail to command the respect of your fellow men."

LETTER boxes have been attached to the street cars in Huddersfield, England, and letters can be posted in these boxes as the cars are traversing the suburbs, the boxes being emptied by the post office employes on the arrival of the car at or near the central post office on each trip. If a person stops the car especially for the purpose of mailing a letter, a penny is collected by the conductor and deposited in the fare box. This doubles the cost of sending the letter, but the advantage of an immediate special delivery is secured, and letters are greatly expedited by the scheme. The scheme is yet an experiment, but it is largely approved.