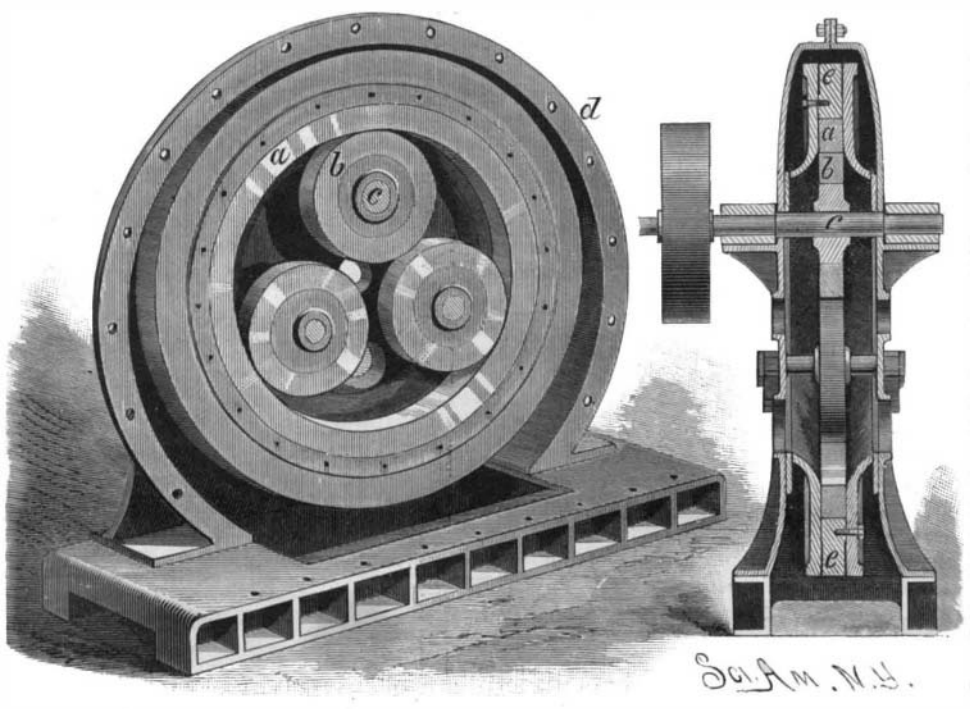
AN IMPROVED PULVERIZER.

The engraving shows a machine for pulverizing ores and similar substances, which is simple in construction, strong, and durable. Within the casing, *d*, is a steel lined ring, *a*, within which are placed three wheels provided with steel tires, *b*, and arranged in a triangle, as shown. These wheels or rolls are mounted on shafts in bearings in the case; the bearings of the two lower rolls are free to move in vertical slots in the case, so that their weight is carried by the ring which rests upon the upper roll, whose shaft is extended to receive the driving pulley, as shown in the sectional view. The revolution of the wheel, *b*, turns, by friction, the heavy ring resting upon it, while the ring revolves the two lower wheels. The ore to be ground is introduced into the space between these wheels, and is carried up by centrifugal force and crushed between the steel tires of the wheels and the steel lining of the ring. There is no slip between the rolls and the ring, and the material is crushed by the weight or pressure of ring on the upper roll and the weight of the lower rolls on the ring. The pulverized material passes out through the small slit-like openings, *e*. The machine is not liable to get out of order, and will pulverize a large quantity, introduced either wet or dry, in a comparatively short time.

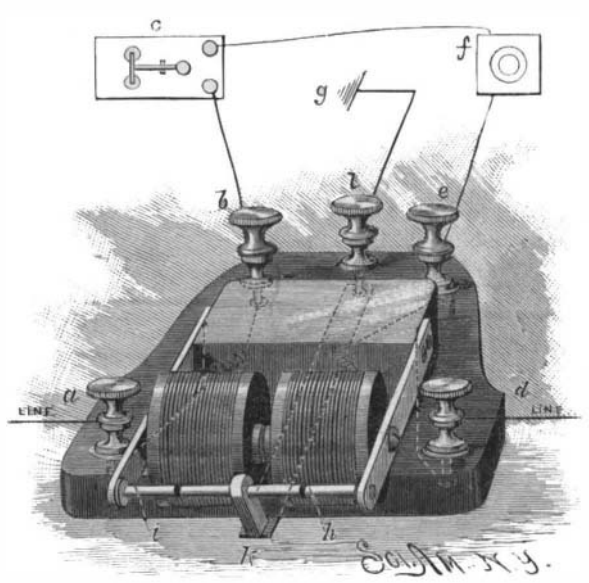
This machine is the invention of Mr. William H. Howland, whose address is Room 25, No. 39 Broadway, New York city.



HOWLAND'S IMPROVED PULVERIZER.

AN AUTOMATIC CUT-OUT AND LIGHTNING ARRESTER.

The illustration shows a simple arrangement for a device calculated for use in telegraph, telephone, and other stations where electrical line instruments are used, one intended not to interfere with the ordinary working of the line, but which will ground the line when the electric current is so greatly increased as to abnormally charge the apparatus, as sometimes happens during thunder storms. The apparatus is mounted on a block, in the center of which is a smaller block, from which project two metallic spring arms that support two electro-magnets wound with coarse, heavy wire, their pole pieces in the center closely approaching, but not in contact with each other. The spring arms project beyond the magnets, and at their ends carry contact points, *h i*, which project inward toward a central standard, *k*, which carries contacts in line and arranged to co-operate with the contacts, *h i*. The standard, *k*, is in electric connection with the ground at *g* through the binding post, *l*. The line wire leads to the binding post, *a*, thence through the spring arm and magnet to the binding post, *b*, to the line instruments at the station, *c f*, back to the binding post, *e*, through the coils of the other magnet to the post, *d*, and on to the line. The magnets, being made of heavy, coarse wire, will not be appreciably affected by an ordinary current, but when they become heavily charged, will so attract each other that the contact points, *h i*, are brought into electric connection with the contacts that extend from the central standard, *k*, thereby grounding the line.



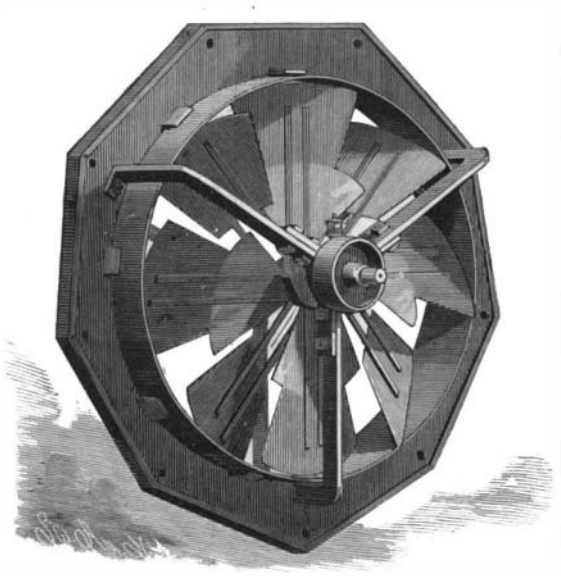
BELT'S CUT-OUT AND LIGHTNING ARRESTER.

This invention has been patented by Mr. Perley P. Belt, of Columbus, Kansas.

SUNFLOWERS are used in Wyoming Territory for fuel. The stalks when dry are as hard as maplewood and make a hot fire, and the seed heads with the seeds in are said to burn better than the best hard coal. An acre of sunflowers will furnish fuel for one stove a year.

IMPROVED ROTARY VENTILATOR.

This invention particularly relates to rotary ventilators for ejecting foul air from apartments or buildings. The bearings for the shaft of the wheel are carried by frames secured by bolts to the front and back of the face plate. The meeting ends of the frames are bent to form a triangular central opening for receiving the bearings, and to provide for uniting the bars together by bolts. The vanes of the ventilating wheel are of special and peculiar construction. Half of the vanes—alternating with the others—are of arc shape, and are only made to extend partly along their arms from the perimeter of the wheel, thereby, so far as they are concerned, leaving a large central opening through the wheel outside of the hub. This opening is, however, mainly covered by the inner portions of the intermediate vanes, the outer portions of which correspond with the others. These inner portions are made much wider than the outer ones and are considerably extended on both sides, so as to slightly overlap each other. This construction, makes the inner part of the wheel much more effective than in wheels of the usual construction, and leaves an ample space between the several vanes for the passage of the air between them. This is also a valuable feature when it is desired to move air against a pressure, as it prevents the air from slipping back through the central opening. The arms carrying the vanes are tangentially, instead of being radially, arranged relatively to the center of the wheel.



BRIGGS' IMPROVED ROTARY VENTILATOR

In a wheel for blast purposes the arrangement of the blades would be somewhat modified. The outer and inner number of blades would be reversed, and the inner blades would be lapped very much to prevent any return of the air. The angle of the blade would be made to suit the work in each particular case.

This invention has been patented by Mr. Edwin F. Briggs, of 1221 De Kalb Avenue, Brooklyn, N. Y.

PEACH ROOT TEA is a remedy for epilepsy, according to Dr. J. L. Dorset, of Dorset, Va. (*Medical Age.*) Three or four ounces of an infusion are to be given daily. Dr. Dorset reports one case in confirmation of his view.

A Use for Fire Damp.

The distressing explosions which occur from time to time in European coal mines, and less frequently in those of America, are in some cases the result of finely divided dust suspended in the atmosphere of the collieries, but for the most part they must be attributed to the presence of marsh gas, the dreaded "fire damp" of the miners. When this hydrocarbon is mixed with air, it forms a highly explosive compound. In the fiery coal pits of England the gas is one of the most serious obstacles to mining operations. It is, however, an excellent fuel, and forms almost the sole constituent of the natural gas issuing from many of the Pennsylvania wells. The proposition has therefore been made, and we believe the actual experiment is now in progress, to drill six inch bore holes down through the coal measures and thus afford an outlet for the gas reservoirs.

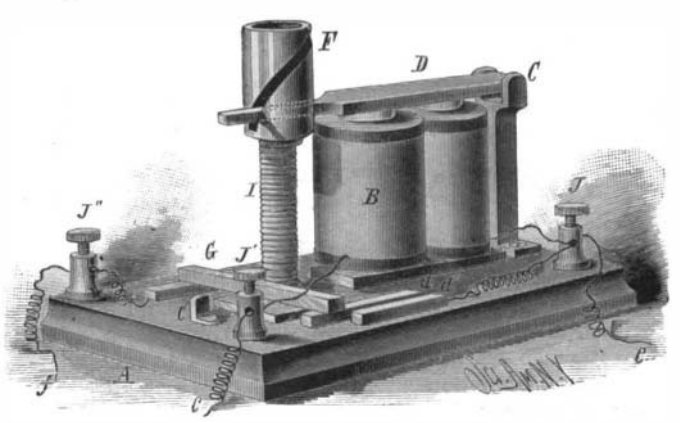
The fluid, if found in sufficient quantities, could then be used as a fuel, while the mines at the same time would be relieved of a very undesirable tenant. The coal mines of western Pennsylvania are fairly free from fire damp, the gas being largely stored in the porous Devonian sandstones which lie above the coal measures. Local conditions have, however, dictated a different disposition of the gas in the geology of England. The coal seams themselves are its depositories. Instead, therefore, of possessing an economic value, it is, under the present arrangement, a constant menace to those engaged in winning the coal. It is hardly probably that these borings would have a sufficient output to make their value comparable with that of American gas wells, but the proposition is well worth considering, if for no other reason than the possibility of lessening the fatality among the miners.

Instrument for Reproducing at Will an Invariable Quantity of Electricity.

The instrument is a voltameter hermetically sealed and thus rendered independent of barometric, hygrometric, etc., fluctuations. The water decomposed by the current during each operation can be reconstituted afterward by passing a spark between two wires sealed in the upper part of the tube.—*Marcel Deprez.*

LIGHTNING ARRESTER AND AUTOMATIC CUT-OUT.

A recent invention to afford an improved lightning arrester and automatic cut-out for dynamo-electric machines is shown in the accompanying illustration. When the current is working normally on the circuit, the armature, D, is drawn down to the bottom of the cam, F, turning the sleeve in opposition to the tension of the spring, I, and bringing the bar, G, into contact with the bar, *d*, of the lightning arrester. The line wire, *e*, is connected with the binding posts, J and J', these posts being connected with the terminals of the magnet, B; and when the line wire is struck by lightning, the current, in passing from *d'* to *d*, to reach the ground through the bar, G, and ground wire, *f*, forms an arc between *d'* and *d*, when the dynamo current will continue to pass the space between the base of the lightning arrester to the ground for an instant, and the diversion of the current allows the magnet to become demagnetized, thus releasing the armature, D, and removing the bar, G, from the bar, *d*, when the arc will be broken and the dynamo current follow its original path. This device also indicates, by its momentary action, if the lightning arrester is clogged with dust or any conductive material, so as to short-circuit the dynamo and send the current to the ground instead of over the line. This invention has been patented by Mr. John Horen, of Omaha, Neb., and the device is being manufactured by Mr. John Brannan, of 439 Lawrence Street, Denver, Colorado.



HOREN'S LIGHTNING ARRESTER.

The "Remington-Lee" Magazine Rifle.

Major Armstrong, late A. P. D., gave a description of this rifle at the English Royal United Service Institution, March 26. In the course of his remarks, he said that the best of soldiers are naturally inclined in the excitement of action to fire away their ammunition fast; and notwithstanding the strictest orders to keep the magazine in reserve, and use the arm as a single loader, until the occasion arose for a rapid and concentrated fire, the majority in any body of men would be pretty sure to draw on their magazines as long as there was a shot in the locker. An officer then could not possibly know whether his men really had magazine arms in their hands or not, unless he examined each arm separately, emptying from it and replacing all the cartridges.

Several attempts have been made to adopt a repeating or "quick firing" attachment to the ordinary breech loader, so as to convert it for the moment into a repeater, but they all leave much to be desired as regards strength, handiness, sightliness, quickness of action, and, above all, rapidity of adjustment and replacement; with none of them can the result be considered really a magazine rifle. "It is," said the lecturer, "in this direction that inquiry and experiment are naturally tending more and more, and I think there can be little doubt the arm of the future will be the best single loader obtainable, plus a good attachable magazine system. I think you will find that practically that ideal has been attained, as regards the latter half at any rate, in the 'Remington-Lee' rifle, invented and patented by Mr. Lee, and made by Messrs. E. Remington & Sons, of New York.

"It is at this moment a simple breech loading rifle, with bolt action differing little from other bolt systems except that it is simpler and stronger than most. This particular model is of 0·45 caliber, rifled with five grooves, taking a complete turn in 20 inches; weight about 9 pounds; and takes the United States Service cartridge of 70 grains of powder with a bullet of 405 grains, giving an initial velocity of about 1,350 feet per second. And the action is particularly quick and easy. The details given can, of course, be varied to any extent desired in the manufacture; the important feature is the independent magazine system. The arm can be used indefinitely in its present form as a single loader, until the necessity arises for the quickest and most concentrated fire obtainable, when it is converted in a moment, at the word of command, into an almost inexhaustible repeater of the most rapid action.

"Any desired quantity of reserve ammunition can be served out in the magazines, each containing five cartridges in no greater space than if they were in the ordinary paper packages. They are made of sheet steel in one piece, with a simple spring to propel and a 'carrier' to guide the cartridges—three pieces in all. They are specially contrived to combine the maximum of strength and efficiency with the minimum of cost, though, if retained, they can be recharged and used hundreds of times. The cartridges are stowed away in them in a moment, and yet are so firmly held that it is scarcely possible to displace them unintentionally, even with the roughest treatment; while the empty magazine is removed and replaced by a full one in less time than is required to insert a single cartridge in the ordinary single loader. This quickness of adjustment is a very important feature, for though the capacity of each magazine is small, it it so easily and speedily replaced that the magazine system is practically inexhaustible, being really limited only by the carrying power of the soldier.

"The rifle has been fired from the shoulder, as a repeater, fifty times in one minute, during an official trial in America, a rate much beyond that of any other magazine arm. The magazine in use offers no inconvenient projection nor unsightly feature, while its weight is so disposed that the center of gravity of the rifle is never disturbed, the balance of the arm remaining therefore always the same; and the cartridges lie always side by side in the magazine, where they are really better protected from all possibility of accident than they could be anywhere else. It is evident that the officer can see at a glance, even from a considerable distance, whether the arm is being used as a single loader in obedience to orders, or if any of his men has brought his magazines into play before the word of command. The charged magazines, moreover, would be carried apart from the loose ammunition until required, in separate pouches, so that to make use of them would involve a distinct and explicit drill motion."

WALLS laid up of good, hard-burned bricks, in mortar composed of good lime and sharp sand, will resist a pressure of 150 pounds per square inch, or 216,000 pounds per square foot, at which figures it would require 1,600 feet high of 12 inch wall to crush the bottom courses, allowing 135 pounds as the weight of each cubic foot. Walls laid up in same quality of brick and mortar, with one-third Portland cement added, will resist 2,500 pounds per square inch, or 360,000 pounds per square foot, which would require a height of wall of 2,700 feet to crush the bottom bricks.

THE DEEPEST FOUNDATION IN THE WORLD.

(*Continued from first page.*)

The location of the bridge is one that demanded extraordinary work, not in regard to the superstructure, but in relation to the foundations for the piers. The bed of the river is made up of mud and soft sand, hard gravel being reached at a depth of 185 feet below high water, and as the rails are to be 42 feet above high water the total height from the bottom of the piers to the rails will be 227 feet. Sinking piers to such a great depth has never been attempted, even in this age of wonderful engineering, and on this account principally the methods to be pursued have attracted much attention both in this country and Europe. The following description of how the work is to be done will, therefore, prove to be of interest.

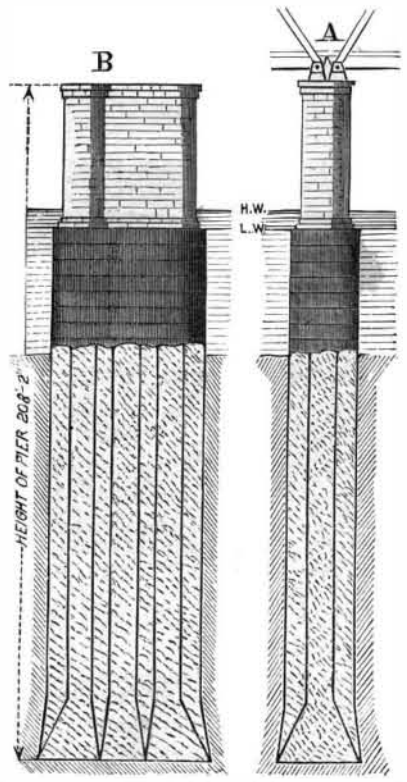


Fig. 3.—SECTIONAL ELEVATION OF PIER.

Like most of the methods of American engineers when called upon to perform an unprecedented work of great difficulty, the chief characteristic of these plans, as now contemplated, is simplicity. The principle governing this undertaking can be readily illustrated by any one. Take two pasteboard tubes, one about one-half the diameter of the other, and arrange them concentrically with the lower edge of the small one a short distance above the lower edge of the large one, and then join the lower edges of both tubes with a piece of pasteboard. This will form a thick cylinder, having a central opening, flaring at the bottom. If this be inserted,

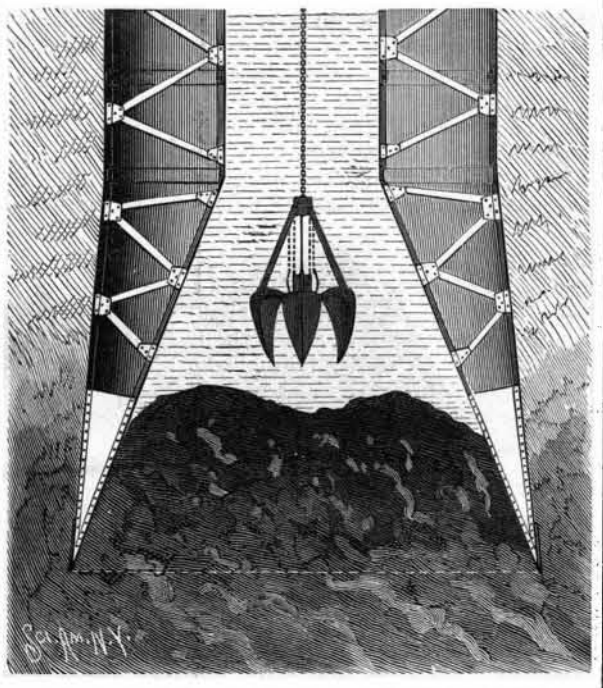


Fig. 4.—ENLARGED VIEW OF BOTTOM OF PIER.

flaring end down, in a bucket filled two-thirds with sand and full of water, it will be found to be next to impossible to push the cylinder to the bottom of the bucket; but if the annular space between the two tubes be filled with sand, and then the sand be scooped out from the inside of the little tube, the cylinder will gradually sink to the bottom of its own accord. This is precisely what will be done in sinking the foundations for the Australian bridge, and what was done in sinking the foundations, to a depth of 125 feet, of the Atchafalaya bridge on the Texas and Pacific Railroad, three years ago.

The outer tube in this instance is oblong in plan, being 20 feet wide by 48 feet long. It is made of boiler plate, three-eighths of an inch thick, and the edges of the several sections are brought together and riveted to a T-bar placed upon the interior, thus making the exterior perfectly smooth and free from offsets. At a point 20 feet from the bottom the tube begins to flare, and the lower edge is 2 feet larger all around than the upper portion. Upon the outside of the bottom is secured a steel plate or cutting shoe, 1 inch thick, 2 feet deep, and projecting 6 inches below the edge of the tube; the lower edge of the shoe is sharpened. Within the outer tube are placed, at equal distances apart, three cylinders or dredging tubes, 8 feet in diameter, made of one-quarter inch iron, and united in the same manner as the outer one. The lower part of these tubes is extended to meet the cutting edge, and the inner and outer tubes are rigidly united by a system of bracing, as shown in Fig. 4, which also represents the bucket to be used. The space between these tubes will be filled as the cylinder sinks with concrete mixed in the following proportion: 1 Portland cement, 2 sand, 3 gravel, and 4 broken stone. After the cylinder has reached a solid resting place, the three inner dredging tubes will also be filled with cement, thus making a pier of solid cement from the bottom to the water level. From low water up, the piers will be of cut stone masonry.

In the sectional elevation, Fig. 3, A is a view at right angles and B a view parallel with the axis of the bridge.

Mixing cement will be done by machinery placed upon a float anchored alongside of the pier. The mixer consists of a square box 16 feet long, provided at each end with an outer ring or collar, which rests upon rollers. A toothed wheel at the outer end meshes with a pinion driven by an engine. The revolution of this box thoroughly mixes the sand and cement, which are introduced through a curved chute leading from a hopper on a platform just above the box. The requisite quantity of water is admitted at the same time. The mixed cement falls from the outer end into buckets, which are carried by cranes where needed on the pier and dumped.

Upon the opposite side of the pier is moored a large float carrying two sets of hoisting machinery. The booms are so arranged that either dredge can be worked in the center or one of the end dredging tubes. Thus, by making one dredge take two loads from its own end tube and one from the middle tube, the amount of material excavated from each of the three tubes can be equalized.

During the sinking of the piers, it is not expected to encounter any formidable obstruction such as a large rock. Trunks of trees may be met, but their presence would not hinder the work in the least, since the great weight of the pier would force the cutting edge of the shoe through them. Tree trunks were met during the building of the Atchafalaya bridge, and in one case where the weight was insufficient to force the shoe through, that part of the log projecting into the tube was grappled and the log broken, when the pier was sunk without further trouble.

The contract price of the bridge is £327,000. The contract for sinking the piers has been let to Messrs. Anderson & Barr, of this city, who superintended the erection of the Atchafalaya bridge.

A Shetland Tirl.

A Dumfermline tourist, who visited Shetland last year, says the *Miller*, of London, England, has given a graphic description in one of the local papers of what he saw in the course of his tour. One of the things which came under his notice was one of the primitive grinding mills called the "tirl" mills of Shetland. He had seen numbers of these in a half ruinous condition in the more northern parts of the mainland, indicating that they were being superseded by some superior system. These "tirl" mills are very low erections, generally built in the side of a brea, down which a stream from some hidden hill loch finds its way. By a simple sluicing apparatus the stream is turned when wanted to run under the floor of the mill in a steep, sloping artificial channel. In this channel is placed an upright circular shaped piece of wood, having an iron spindle in the center. The lower end of the spindle is fixed in the channel, while the upper end finds its way through the floor of the mill and is attached by a cross piece to the upper millstone. The circular shaped piece of wood is fitted with six projecting boards, against which the water strikes as it rushes down its prepared course, and so sets the upper stone in motion. Through an opening in the center of this stone the corn is fed in by hand, and the meal, as it is ground, percolates from between the stones, and falls on a clean clay or boarded portion of the floor, from whence it is gathered. The stones are about thirty inches in diameter and from three to five inches thick. Grinding mills of a more modern type are now, however, established in several districts among the islands, and gradually the "tirl" is being replaced by the superior article. Still the "tirl," and even the quera, driven by hand, are found in use in various parts of both Shetland and Orkney.