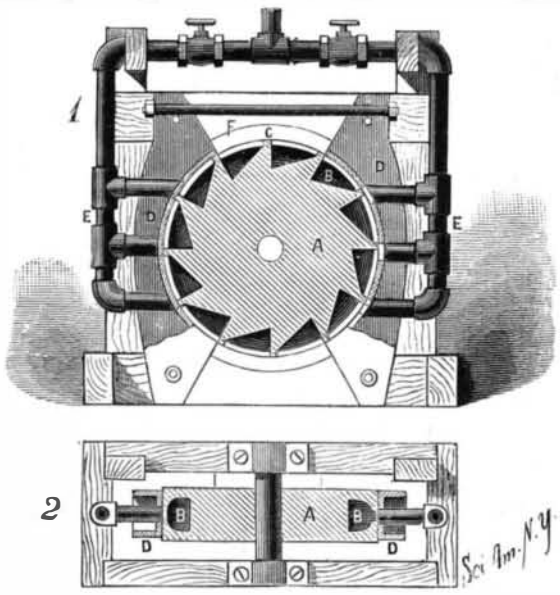
A STEAM WHEEL, OR ROTARY ENGINE.

The illustration herewith clearly indicates the principal details of construction and arrangement of parts in a rotary engine, or steam wheel, which has been patented by Mr. Robert Powers, of Charleston, Miss. In our engraving, Fig. 1 shows a transverse sectional elevation, and Fig. 2 a horizontal section. A represents a cast metal disk of any approved size, with cavities or pockets, B, in the face, separated from each other by narrow bridges, C, there being narrow slit openings through the face of the disk to the cavities



POWERS' STEAM WHEEL.

or pockets. One or more covers, D, are fitted steam-tight to the face of the disk, having passages through which steam is admitted to the cavities from the boiler by the pipes, E, while F represents exhaust spaces, between the covers, D, on opposite sides of the wheel, for the escape of the steam after it has done its work. These exhaust spaces are arranged at such distance from the last inlet passage that the exhaust will not open until the steam pocket has passed entirely beyond the inlet, and the inlet is cut off from the exhaust by the bridge between it and the next cavity. The covers, D, are strongly bolted to the bed-frame, and are connected by rods having nuts, to draw them tight up against the face of the disk, from time to time, these covers to be also faced with a lining, so they may be taken off and refitted as required, or renewed when worn out. It is provided, further, that instead of covers there may be a continuous case surrounding the disk, with proper inlets and exhaust cavities, the invention contemplating a practical working rotary engine which shall have as few parts as possible and the utmost simplicity of detail.

Feat of the Divining Rod.

The question as to the magical or the scientific value of the "divining rod" has just been reopened by the success which has attended its use at the Fletton Wagon Works of the Midland Railway Company, England, with reference to the discovery of a permanent supply of water. According to *The Sanitary World* (London), the company requires to use about 500 or 600 gallons of water every day, and the well on their premises yielded only one-half of that quantity. It was necessary, therefore, to supplement the supply by the sinking of other wells or by the construction of an expensive system of piping. The former plan was preferred, and two new wells were sunk to no purpose. The services of a gentleman of the district, who bore the reputation of being skilled in the art of discovering water by means of the "divining rod," were then called in. This wizard or expert employed for his purpose a forked hazel twig, holding one prong of the fork in each hand, the points of the fork being directed to the sky. After walking about the premises for some time, the point of the fork suddenly began to bend down, purely, as the best evidence goes, of its own accord, and to point to the earth. The wielder of the wand declared that here would be found a plentiful supply of water. The same indications were repeated at another spot, where the twig snapped from the violence of its spontaneous and sympathetic motion, and the same confident assertions were made with reference to the occurrence of water—assertions which the results obtained by actually sinking wells amply justified, the quantity of water to be obtained being apparently inexhaustible. Other persons essayed to use the wand, but it rebelled against the usurpation of its owner's functions, and remained contumacious and irresponsive. If any persons, adds the writer, require water in unlikely localities, it might be well to secure the services of this diviner before he volunteers for a patriotic mission in favor of the troops in the thirsty wilds of the Soudan.

SAFETY GAS BURNER.

The body of the burner, A, is fitted with a diaphragm, B, in its lowest portion, formed with holes to allow the gas to pass to the tip. Upon the under side of the diaphragm is a slide valve, D, held to its seat by a flat spring attached to the diaphragm. The valve stem, G, of spring metal, rests in notches in the valve, in which its end is screwed to permit it to be adjusted; the stem passes out at the side of the burner, and upon its outer end is a nut. A spiral spring presses the valve to open it. At opposite sides of the burner are arms, I, extending above the tip; to one arm is pivoted a lever whose long arm is forked at its end to take upon the nut on the stem. A small rod, M, of brass, silver, or other metal having a high rate of expansion, is connected to the short arm of the lever and to the arm at the opposite side of the burner. By adjusting the nut, the valve is moved over the apertures, and thus retained when the burner is not in use. When the gas is to be lighted, the nut may be turned out so that the spring will open the valve, and then screwed up against the lever when the flame has been burning long enough to fully expand the rod, M. But it is better not to change the adjustment of the nut, the valve being opened by pushing the stem inward. In case the flame is blown out, the valve will be moved and the apparatus closed by the contraction of the silver rod.

This invention has been patented by Mr. Merry L. Pence of Lexington, Ky.

COMBINED GRAIN DRIER AND COOLER.

In our issue of Sept. 30, 1882, we published an illustrated article describing a new invention for drying and cooling grain, seeds, coffee, etc., in one continuous operation; this machine went into immediate use, and has been operating very successfully ever since. The maker's claim of durability has been fully sustained, the first machine, after running three seasons, now being in good order and not having required a total expenditure

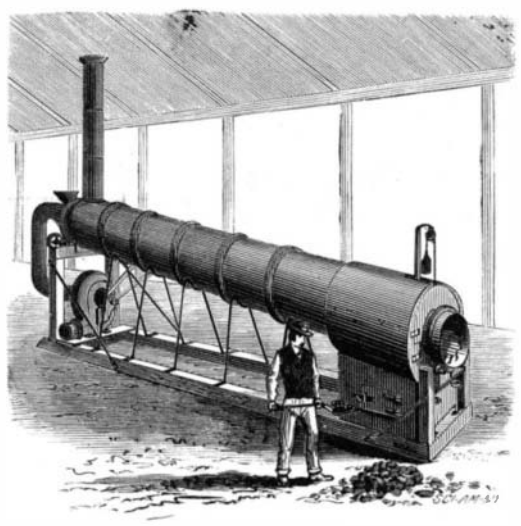
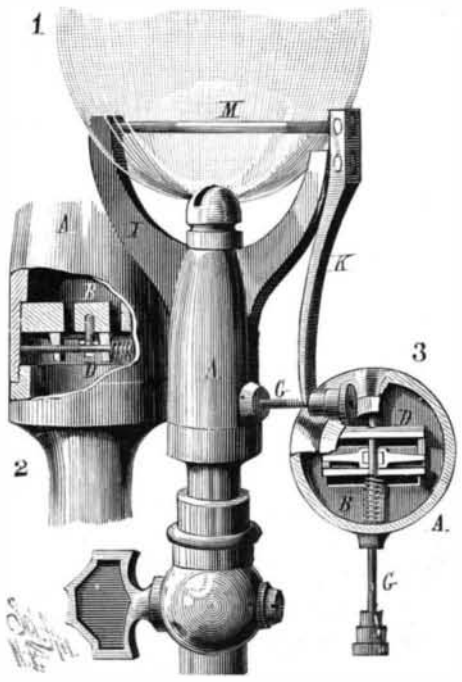


Fig. 1.—COMBINED GRAIN DRIER AND COOLER.

of five dollars for repairs. The inventor has recently added some improvements which increase the capacity and efficiency of the drier in further reducing the temperature of the delivered products; this is an important matter in warm climates, and also during a few summer months in the Northern States. These changes consist in increasing the heating surface by adding to the length of the furnace, thus saving fuel, and also in adding a supplementary cooling cylinder and exhaust fan, thus doubling the air current. The inventor has lately completed two new machines, which are illustrated so plainly in the engravings as to need but a short description.

Figure 1 is a portable drier, styled No. 1, of moderate capacity, adapted to the wants of small dealers. No cooling arrangement is shown, not being positively required in a machine of this size unless the room is limited. A new departure is taken in constituting the entire furnace of fire clay material, this being of much lighter weight and giving a better appearance than the conventional furnace of sheet iron lined with



PENCE'S SAFETY GAS BURNER.

brick. It is compact, occupying a floor space of only 2 feet by 20 feet, and strongly braced, so as to stand distant shipment and frequent removals. Motion is transmitted to the drying cylinder in the same manner as in the larger machine, by two grooved friction wheels of chilled iron or steel, each revolved by a sprocket wheel, and both being connected by one link-belt chain to the shaft back of the drier. This is an advantage over the former method of belts and pulleys, and has been adopted in all of these machines.

The exhaust fan is driven from the same shaft. A gate is placed in the air pipe for gauging the current to any required strength. The feeding hopper is shown at the left of the smoke stack. At the right can be seen the lifting screws for raising or lowering the end of the cylinder, to increase or shorten the time of the passage of the material through it, which should be varied according to the amount of moisture to be removed. The numerous troughs shown at this end extend the entire length of the case, lifting and dividing the grain into a number of thin falling sheets, thereby presenting a large surface for the air to come in contact with, in order to absorb and remove the moisture. Scorching cannot occur as long as the cylinder and fan are in motion. This machine has a capacity of 40 bushels of ordinarily damp grain per hour, weighs 4,000 pounds, and requires 2 horse power, consuming 60 pounds of coal; coke, charcoal, or wood can be used as fuel. The machine is well adapted for drying granulated tobacco and roasting coffee, for which purposes some slight changes are necessary.

Figure 2 illustrates the No. 2 improved driers and coolers, run in a gang, to meet the requirements of elevators or large operators. It has a capacity of 5,000 bushels damp grain per day of twenty-four hours, or double that amount if used alone for cooling purposes. No motive power is shown, as it is customary to locate plants of this size adjoining an elevator or warehouse, which furnishes power and storage facilities. As shown, it is arranged for drying damp grain supplied to it by the conveyer at the left, under which are seen the feed gates and spouts for dropping the grain through the suction bonnets into the drying cylinders, arranged as described above. Owing to the inclination of these revolving cases, it is gradually carried to the lower ends, being at the same time constantly subjected to the current of air drawn through the cylinders in the opposite direction by the exhaust fan.

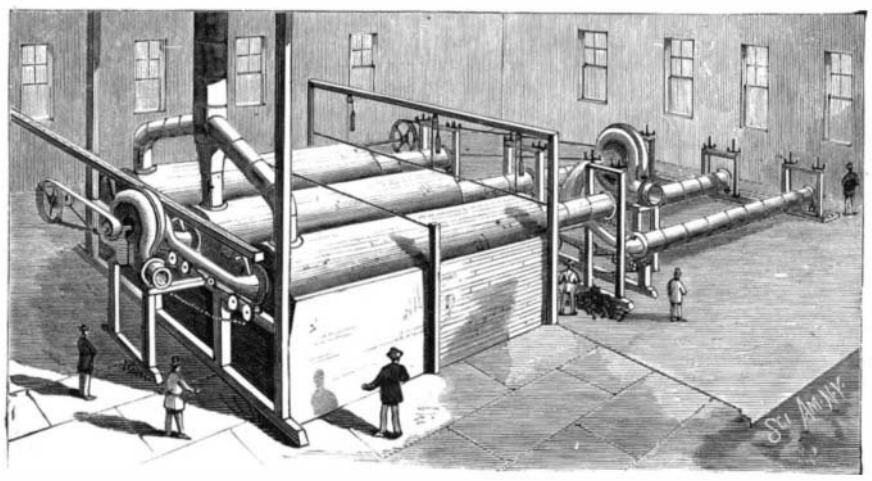


Fig. 2.—COMBINED GRAIN DRIER AND COOLER.

The grain now falls into the cooling cases and undergoes the same treatment, omitting the heat, after which it is discharged into the conveyer at the extreme right of the cut in a dry, clean condition (the continued friction and attrition with the metal surface scouring off the dust, which is removed by the current of air), ready for immediate grinding, shipment, or storage in bulk, with no taint, or so slight as to escape the notice of inspectors or millers. The patentee has a number of letters from millers who have used it for the highest grade flour. A single countershaft, carrying two pulleys and two sprocket wheels, drives the whole machine. The maker lays particular stress upon its very perfect

adaptation to cooling "hot" grain. The following table has been prepared from actual measurements and practice:

Total square feet iron heating surface	591
Total square feet iron cooling surface	887
Total square feet iron surface inside of cylinders	1,478
Total square feet grain surface exposed to air currents	1,212
Total cubic feet air drawn through the grain per minute	7,338
Total lineal feet traversed by grain during operation	600 to 1,200
Time of passage	15 to 30 minutes.
Total weight of iron work complete, about	19,000 lb.
Total horse power required	18
Cost of drying grain for one day of 24 hours:	
4 tons of coal at $2.25	$9.00
2 men, fireman and foreman, two days each, $1.50	6.00
Cost of motive power at 50 cents per H. P.	9.00
Oil, etc.	50
	$24.50

Results—5,000 bushels dried at a cost of less than one-half cent per bushel.

Cost of cooling "hot" grain for one day of 24 hours:	
One foreman, 2 days' time, at $1.50	$3.00
Motive power	9.00
Oil, etc	50
	$12.50

Results—10,000 bushels at a cost of one-quarter of one cent per bushel.

It requires a space 48 feet long, 24 feet wide, and 12 feet high, but these can be reduced somewhat when necessary. In order not to injure the grain, the time required for the removal of moisture can be increased by adding a series of return conveyers, by which the grain, after it has passed through the first drier and cooler, is returned to the head of the second set, and so on until it has passed through the whole gang. Its passage can be retarded to any extent by bringing up the discharging end nearly to a level.

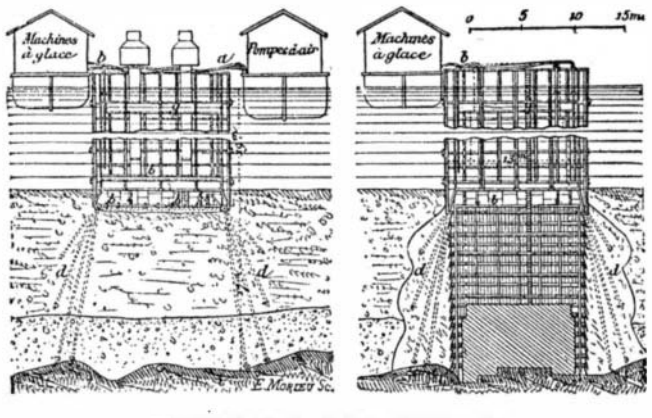
The maker claims superiority on the following important points: Economy of operation, drying and cooling in one operation, simplicity and durability, requiring no expert labor, perfect results, ability to use any kind of fuel, frictional instead of cog gearing, cool and clean operating room, and no extra-hazardous insurance rate.

Machines furnished only by the patentee, Mr. Stanley E. Worrell, Hannibal, Mo., who will supply further information upon application.

THE SINKING OF SHAFTS BY FREEZING.

The sinking of mine shafts by freezing was first practiced by Mr. Poetsch at the Archibald Mine. The method consists in driving into the earth, around the perimeter of the shaft, a series of pipes that are closed at the bottom and that contain other pipes. A freezing mixture forced into the inner pipes ascends through the annular space and is forced by a pump to a refrigerating machine in order that it may give up the heat recovered and then begin the same travel again.

Mr. Poetsch's experiment, as conclusive as it was, was performed upon a shaft of 18 feet depth, only, sunk through wet quicksand. So Mr. Haton de la Goupillere, in briefly describing the operations before the Societe d'Encouragement, expressed the opinion that it would be absolutely rash to undertake to sink very deep shafts by such a process. New attempts have nevertheless been made since with entire success at the Centrum Coal Mines at Konigs Wusterhausen. Here 108 feet of quicksand were frozen in 33 days with 16 pipes analogous to the preceding. The mass solidified around the circumference of the shaft was ten feet thick. At the Emilia mine likewise a 9 foot shaft was sunk through a 118 foot stratum of quicksand.



SINKING SHAFTS BY FREEZING.

In these different operations, the temperature, which reached —19° at the bottom of the shaft of the Archibald mine during the last days of the experiment, was taken only at the moment of the observer's descent. After remaining at the bottom for a certain length of time the temperature of the air gradually rose, and when several workmen were occupied permanently at the bottom it remained at a temperature of between 0·5° and 1°. So, after quite a short period of reheating of the air, the cold caused no inconvenience to the workmen, but, on the contrary, rather braced them up.

One of the most interesting peculiarities is that the congelation is sufficient to allow the quicksand and the surrounding earth to be taken out in a single block. At the Archibald mine, for example, when the stratum of lignite was reached it was found that the earth was frozen to over a yard beneath the extremity of the pipes, and the top of the stratum was so intimately cemented to the superposed quicksand that pieces could be broken from the mass without a fracture occurring at the plane of separation of the layers.

This fact proves that the Poetsch system may be applied with equal efficacy, whatever be the inclination of the strata, since the congelation converts the earth into a perfectly homogeneous mass. It might in certain cases especially be employed in the driving of submarine tunnels, and the *Engineering News* observes that the Hudson River Tunnel would be particularly suited for the application of it, since the stratum of sand and mud at the bottom has a very uniform composition, and would permit of working at every operation over lengths of from a hundred to a hundred and fifty feet.

A close examination of the frozen portions has demonstrated that the thickness of the block of ice increases with the depth. This is due to the fact that, through the direction given the freezing mixture, the maximum of its action is exerted at the base of the pipes. There forms, therefore, around each of the latter a truncated cone of ice whose larger base is situated beneath. These truncated cones gradually increase and finally penetrate each other, until the whole earth forms but a single block of ice.

We may conclude from the results obtained that, with a circular shaft, congealed earth over a yard thick permits of the sinking of a six and a half foot shaft without lining. The pipes are driven in different ways. When the shaft is already sunk up to the level of the water, and the stratum of wet earth is not very thick, it suffices to drive the pipes into the sand by removing the latter from the interior by means of a sand pump. In wet earth of some depth, a boring machine is employed. This puts down four pipes at once. If the strata to be traversed contain erratic blocks, the latter are avoided by inclining the hole, or, if they are too large, they are traversed by a special tool.

Mr. Poetsch proposes to apply his system to the constructing of bridge piers, and has just made a contract with the government of Roumania for the construction of the twelve piers of the great Bucharest Bridge.

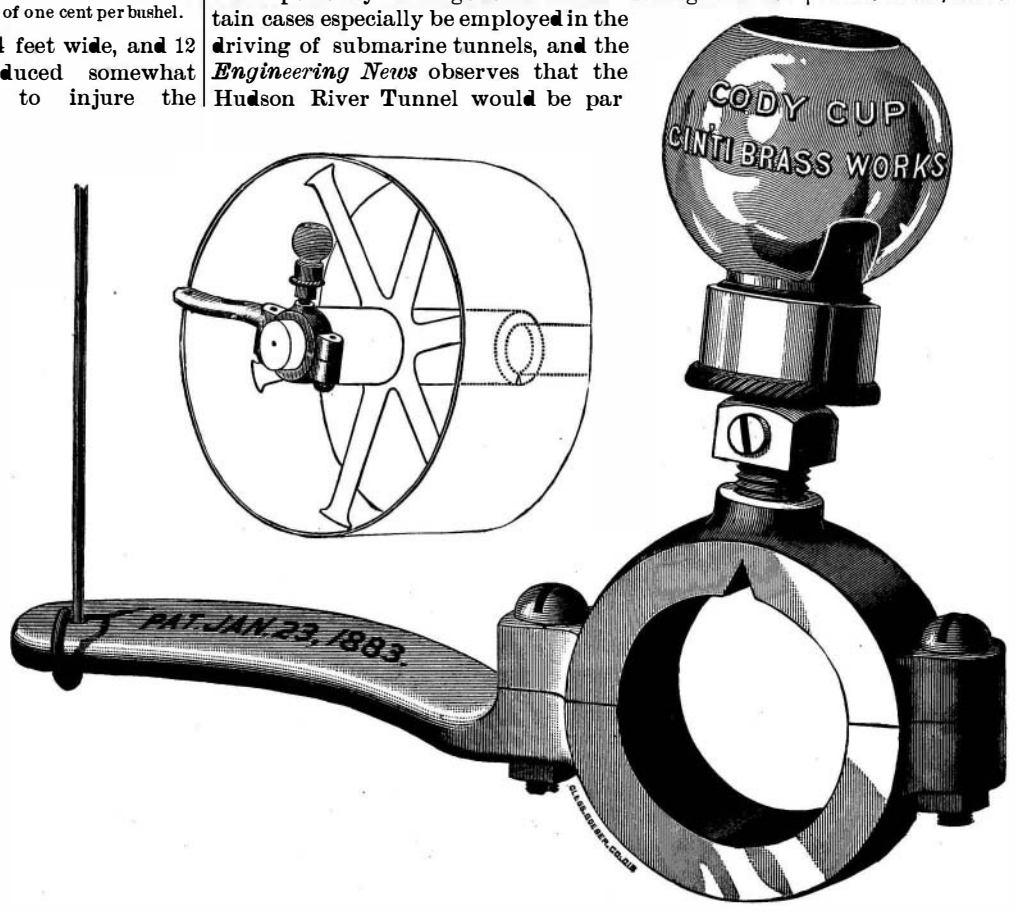
According to the *Techniker*, it is his intention to proceed by two methods. The first (Figs. 1 and 2) constitutes a combination of the compressed air and freezing methods. After sinking the working chamber by ordinary methods twelve or fifteen feet beneath the bottom, the freezing pipes will be driven beneath and around its perimeter in such a way that the whole mass contained in the cavity to be formed above the rock may be taken out in a block. The caisson will then become water tight, the air lock will be removed, and the work will be effected in the open air.

In the second process the use of compressed air will be dispensed with. After sinking an open caisson over the location of the pier, the pipes will be driven. After the freezing has been done, the water will be removed from the caisson by pumps, and the work will be performed in open air.

In order to preserve the masonry from the freezing action of the surrounding mass, it is Mr. Poetsch's intention to line the side of the cutting with a layer of straw, and to form the joints with a mortar of sand and tar or asphalt.

The experiments of Mr. L. Malo have demonstrated, moreover, that masonry with asphalt joints is susceptible of perfect cohesion.

The Poetsch method, which now appears to have entered into practice for sinking shafts in wet earth, presents the great advantage over all previous systems of allowing the cost and duration of the process to be exactly foreseen. Besides, it secures a vertical sinking of the shaft, since the operation is performed in solid earth; it completely dispenses with pumping apparatus, and does away with those special difficulties entirely that originate in the inclination of the moist strata.—*La Nature.*



LUNKENHEIMER'S AUTOMATIC LOOSE PULLEY OILER.

AUTOMATIC LOOSE PULLEY OILER

The great obstacle which has heretofore prevented the successful oiling of loose pulleys has been that centrifugal force kept the oil away from the bearings. The oiler herewith illustrated (shown detached and in place upon the shaft in the figures) overcomes this objection, and is simple in its construction, which will be easily understood from the engravings, durable, easily applied, and very perfect in operation. In addition, it is economical, the manufacturer stating that one ounce of oil is sufficient for several months. It requires a space of three-fourths of an inch on the shaft, upon which it is set loosely so as to bear against the hub; it is kept in place by a slip collar, unless it fills up the space between the hanger and loose pulley. To keep the oiler stationary, a hole is provided in the arm to fasten a wire, which can be attached to the ceiling or wherever convenient. On wide pulleys a slot or groove should extend through the entire length of the bearing and terminate in a V-shaped notch. As this will cause a suction, prevent a vacuum, and freely supply oil from end to end of the bearing, the feed is regulated by means of a slotted screw working like a common stop cock.

Full particulars can be obtained by addressing the manufacturer, Mr. F. Lunkenheimer, proprietor Cincinnati Brass Works, Cincinnati, O.

COVER FOR COOKING UTENSILS.

The engraving represents a cover for cooking kettles

GOODALE'S COVER FOR COOKING UTENSILS.

or utensils lately patented by Laura M. Goodale, of Marshalltown, Iowa. Fig. 1 shows a coffee pot and Fig. 2 a kettle arranged with this cover, which is shown detached in Fig. 3. Within the lower portion of the cover,