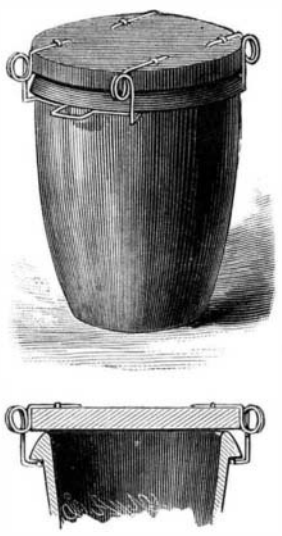
JAR COVER.

The cover, which is about the same diameter as the rim of the jar, is made of wood rendered waterproof by varnish or paint. To opposite edges are secured wire fasteners made of iron or steel spring wire, copper coated, or of brass wire. The form of these wires is clearly shown in the engraving. The cover is placed on the jar by bringing one of the spring fasteners into engagement with the under side of the rim of the jar, then pulling the other fastener until it will pass over the rim, then pushing down the cover and releasing the second fastener, which will engage with the rim. The cover is removed by pulling out one of the fasteners. The cover can be made to fit any size jar. This invention has been patented by Mr. W. F. McFarland; particulars can be had from Messrs. McFarland & Rowles, of Pleasantville, Ohio.



The United States Cotton Harvester.

The United States Cotton Harvester, invented by Mr. Owen T. Bugg, of Georgia, was recently exhibited in operation at the New York Cotton Exchange. In spite of certain disadvantages arising from the slipping of the wheels on the polished floor, and the brittleness of the dried cotton plants, the trial was pronounced successful by the planters in attendance. The cost of harvesting the lint by hand is at a low estimate $10 per bale, while with this machine the inventor states that the cost will not exceed $1 per bale. Should he be able to realize these figures in practice, the innovation will be of great importance to the entire cotton-growing district.

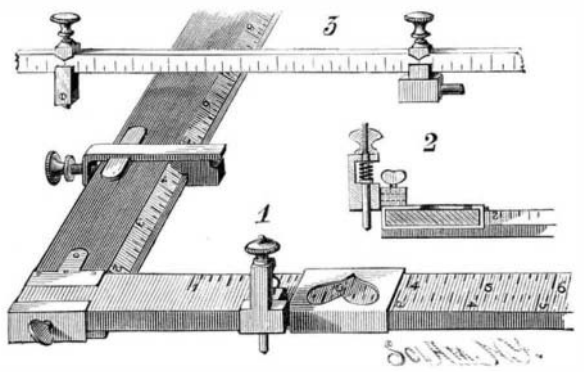
Honor to Whom Honor is Due.

Mr. Alvan Clark, of Cambridge, Mass., the famous telescope maker, has received from the Czar of Russia the honorary golden medal of the empire, "in acknowledgment of the excellent performances of the great object glass" made for the chief telescope in the Pulkowa observatory. This medal is seldom bestowed, and only for extraordinary merits.

GLASS CUTTING GAUGE.

By means of this gauge, panes of glass can be cut at true angles or on curved lines, exactly and rapidly. On one end of the main part of the gauge is a clamp for holding the tongue in place, as shown in Fig. 1. Mounted on the tongue is a slide, having a recess in its top; in the edge of the recess is formed a pointer, which indicates the position of the slide on the scale on the outer edge of the tongue. On the upper surface of the slide is a projection having an aperture for receiving a pin projecting from a block, as shown in Fig. 2. The diamond for cutting the glass is held on the lower end of a rod passing through this block, a spiral spring pressing the rod downward. On the main part of the gauge is a guard which can be locked in place, thereby facilitating the cutting of large quantities of glass of the same size. To cut along the edge of the tongue, the slide is moved, the spring permitting the diamond to give more or less where there is any unevenness in the glass. To cut the glass on curved lines, the block shown in Fig. 1 is removed, and that shown on the right of the sweep, Fig. 3, is adjusted on the slide mounted on the tongue. The sweep, which is provided with a diamond carried by a sliding clamp, is then swung to describe the desired circle, the center of the glass being located by the pointer on the edge of the recess in the slide on the tongue.

This invention has been patented by Mr. E. O. Boyle, of Chateaugay, N. Y., who will furnish all further particulars.



BOYLE'S GLASS CUTTING GAUGE.

AN ENGLISH STERN WHEEL STEAMER FOR THE NILE.

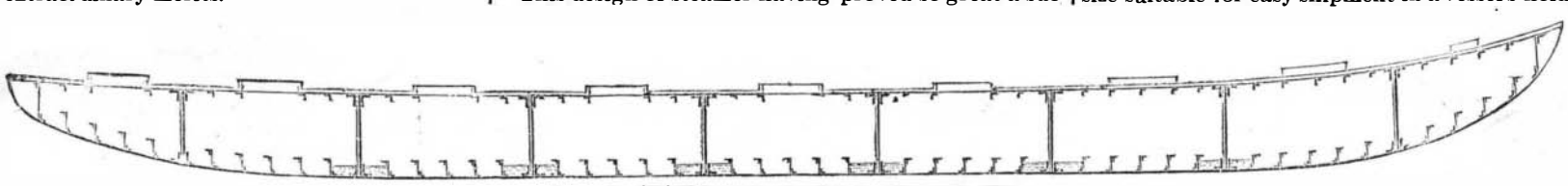
Stern wheelers have of late come very prominently before the public in consequence of the success which attended those built by Messrs. Yarrow & Co. for the Nile expedition. It will be recollected that in the latter part of 1884 the Government determined to immediately advance upon Khartoum. Had steamers been available at the time, suitable for the navigation of the Nile, they would undoubtedly have been adopted; but such not being procurable, the authorities resorted to the now well-known rowing boat system. There was, however, a stern wheeler partly finished in Messrs. Yarrow & Co.'s yard at Poplar, which was being constructed for a South American firm, and this the Government purchased. Immediately after she was shipped, the War Office ordered an exact facsimile to be put in hand and finished with all speed, and it will be remembered Messrs. Yarrow & Co. completed her in the remarkably short period of seventeen days. These boats were 100 ft. long by 18 ft. beam, drawing 18 in. water. One of them was put together above the second cataract near Wady Halfa, and was ultimately named the Lotus.

This design of steamer having proved so great a success, Lord Wolseley desired the Government to immediately contract with Messrs. Yarrow & Co. for eight more, which were forthwith proceeded with, and one of these forms the subject of our illustration, which has been engraved from a photograph taken in Egypt. Some of them were fitted up as gunboats, and some for transport purposes. A large gun was placed on the upper deck, forward, commanding, from its elevated position, a good range over the river banks. There were also eight Nordenfelt guns, having shields in front of them, in various parts of the vessel, placed so as to receive an all-round fire. Forward, on the lower deck, is a shot-proof house capable of accommodating eight riflemen, and high above the rest will be seen the conning tower, from whence the navigation is directed.

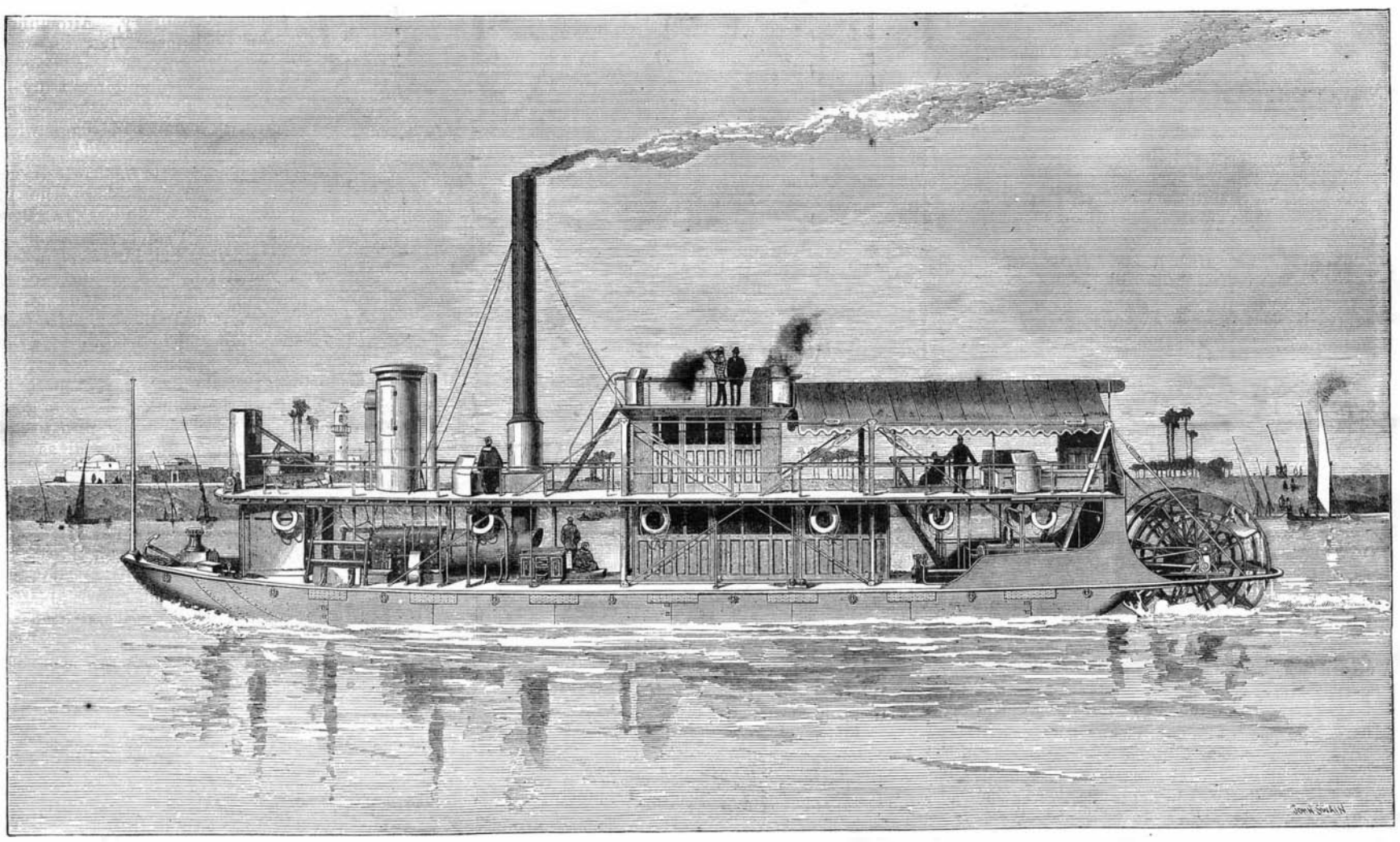
In order to secure economy of fuel, which is very scarce in Upper Egypt, the engines were compound surface condensing, and the boiler, which was of the locomotive type, was arranged either for burning wood or coal, it being provided with a fan and closed ash pan, to be utilized at times when an extra supply of steam was needed to ascend any specially rapid part of the river. Under ordinary conditions of working, however, a forced draught was not used, so as to avoid the wear and tear of the boiler.

The general arrangement of the cabin accommodation is clearly seen from the engraving.

There is one point about the construction of the hulls which is deserving of special notice, namely, the manner in which they are designed, with a view to being put together with the greatest possible rapidity. To fully explain the system, we refer to the accompanying engraving. The hull is divided into several transverse sections, each section having water-tight bulkheads at both ends. When afloat, they draw 6 in., and are of a size suitable for easy shipment in a vessel's hold, and of



HULL OF STERN-WHEEL STEAMER FOR THE NILE.



AN ENGLISH STERN WHEEL STEAMER FOR THE NILE.

being readily handled and transported overland. The sections were conveyed to their destination at Cairo, there lowered into the river, and immediately united together afloat. The angle iron which joins the transverse bulkheads to the skin plating is of larger size than the rest of the frames, to admit of a number of holes through which bolts may be passed to join the sections together. It will be seen that the floor plates, being 15 in. deep, are of such a height that although the water will pass through the holes in the bulkheads, it cannot rise to so high a level as to flow over into the interior of the section, which therefore remains afloat. This enables the bolts to be passed through and to be tightened up, uniting the sections firmly together; when this is done, the small amount of water left can be easily pumped out.

This mode of construction has been found to be highly successful, and, as a matter of fact, one of the hulls of these boats was connected up completely in five hours. There seems to be no deficiency in strength incurred by this system, because the nature of the strains thrown upon these stern wheelers is of such a character that there is always a compression throughout the entire hull, tending to keep the sections together and not to separate them.

It is a fact not generally known, says the *Engineer*, that for a certain indicated power a stern wheeler gives a somewhat greater efficiency than a side wheeler. Not only does the design enable an exceptionally light hull to be built with ample strength, but the position of the wheel is specially favorable, because, as pointed out by Mr. Wm. Denny, it acts upon the water at a point where it has a definite forward motion, *i. e.*, at the top of the following wave. It also lends itself to an arrangement of steering gear by means of three or four rudders placed between the wheel and the hull, which secures a maneuvering power impracticable with any other mode of propulsion. This is, however, particularly the case when going astern, which is an essential condition necessary to be complied with in shallow river navigation. The disadvantage to this system as compared with screws is that the engines are, for a given power, of greater weight on account of their slow movement. This would no doubt be a consideration in navigating those rivers where skilled labor is available and repairs easily executed; but in those parts of the world, as on the Upper Nile for example, where such is not the case, the slow moving machinery is, beyond all doubt, far more trustworthy and less liable to derangement or early depreciation from wear and tear. Moreover, the entire machinery is accessible for repairs while the boat is afloat, every part being above the water; while, on the other hand, with a screw propelled steamer, should its propellers or shafting get bent or broken, which in such navigation is likely to occur, it involves lifting the stern of the vessel out of the water or placing it in a dry dock—conditions which it is impossible to comply with in many foreign places.

A Curious Savings Bank.

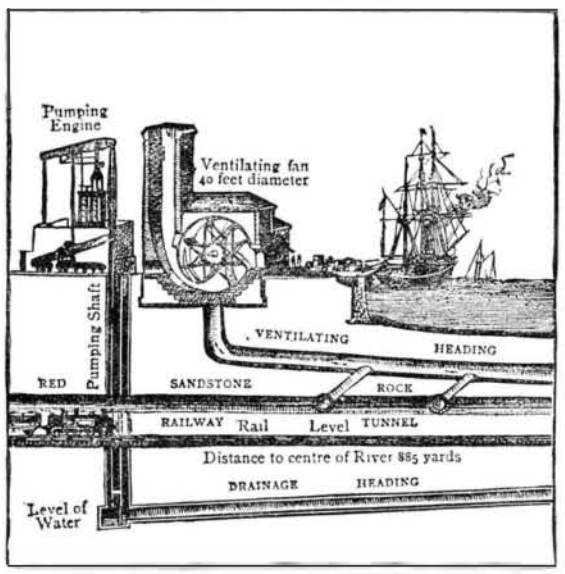
Some years ago, an old wooden bridge spanned the Schuylkill River at the foot of Penn Street, Reading, Pa. In the course of time a more substantial structure was deemed necessary, and the timbers of the old bridge were carefully taken apart, and reserved for use in repairing and rebuilding the smaller county bridges. While preparing some of this old timber for its new use, a few days ago, it became necessary to saw off several feet from a heavy piece, which was to be used as a girder in a small bridge under contemplation. When the end portion dropped to the ground, the workman was astonished to hear a jingling sound as of gold and silver coin. A summons of such good omen insured a speedy investigation, which resulted in finding eagles, half eagles, silver dollars, halves, and quarters mixed together in careless confusion. The source of supply was found in a section about eighteen inches in length and five inches deep, which had been hollowed out of the log with auger and chisel. An inch thick cover had been fitted over the opening so cleverly and sealed with so much care that detection, other than accidental, was hardly possible. The treasure had been confined in a home knit woolen stocking, and as the saw cut off the toe, a part of the contents was discharged.

The value of the deposit, though reported to be considerable, was not made public. The money was probably hidden away a number of years ago, as specimens of three, five, ten, twenty-five, and fifty cent scrip, nicely folded up in a piece of writing paper, were among the contents. Not a line indicated the ownership. The question of possession is consequently divided as to whether it should go to the workman who discovered it, the owner of the timber, or the county. The finder probably inclines to the first suggestion.

THE MERSEY TUNNEL.

(*Continued from first page.*)

for the construction of a tunnel under the Mersey was introduced into Parliament. Commercial panics and the opposition of vested interests, however, prevented its passing until 1871. Even then the work was languidly supported, and it was only in 1879, when an arrangement was made with Major Isaac, that the work began to advance. Since that time the organization has been so perfect that progress has been unceasing, and among 3,000 men constantly employed, no death has occurred for which a coroner's jury has blamed the company or the contractor.



SECTION SHOWING RELATIVE POSITION OF RAILWAY TUNNEL, DRAINAGE AND VENTILATING HEADINGS.

The Ventilating Fan draws the Air from the Tunnel under the River at any Desired Point.

The initial boring experiments showed that there was an almost uninterrupted stratum of red sandstone beneath the bed of the river, and through this the tunnel has been made. Though no actual inundation occurred, the percolation of water, owing to the porous nature of the sandstone, proved a source of considerable difficulty. This was removed, however, by the gigantic pumps erected at both ends of the tunnel, of which we give illustrations. They were kept constantly going, and were capable of delivering 300 gallons per stroke. On the 17th of January, 1884, little more than four years after the undertaking had been regularly taken in hand, the workmen on the Birkenhead side shook hands with those from Liverpool. So accurate had been the calculations of the engineers, that the centers of the borings were less than an inch apart. The rapidity with which the work had been carried out was greatly due to the use of Colonel Beaumont's boring machine, which is driven by compressed air, and scoops out a tunnel seven feet in diameter; large quantities of explosives, however, were also employed in the excavations. The tunnel, which is laid with a double line of rails, is well drained and ventilated. The ventilating tunnel, 7 feet 2 inches in diameter, is placed parallel to the main tunnel, and at a distance of about 20 feet from it. The ventilation is accomplished by means of fans. Two of these, each 40 feet in diameter, placed, one at Liverpool, the other at Birkenhead, ventilate the section of the tunnel which lies under the bed of the river, while two smaller fans purify the air in the two extremities of the tunnel which lie beneath the land. When these four fans are all at work at once, they can draw out of the tunnel 600,000 cubic feet of air per minute, thereby changing the whole air of the tunnel once in every seven minutes. In consequence of the great depth of the river, and the comparative shortness of the line, the gradients are somewhat severe, but this drawback is obviated by the use of exceptionally powerful locomotives, which will perform the journey between Liverpool and Birkenhead in less than four minutes. At either end lifts capable of raising a hundred persons at a time have been erected, so that there will be very little delay in getting from the streets to the railway which lies so far beneath them. The tunnel is already in full working order, and trains run freely through it. On the Cheshire side it is joined by the Great Western Railway system. All that now remains to be done is the connection of the tunnel railway with the Lancashire railway system.

Mr. C. Douglas Fox, Engineer to the Mersey Tunnel.

Mr. James Brunlees, Engineer to the Mersey Tunnel.

Mr. A. H. Irvine, Resident Engineer, Mersey Railway.

ENGINEERS OF THE NEW MERSEY TUNNEL.

Well Finding.

In the London *Times* of February 9, 1885, appeared the following paragraph: "The *Allgemeine Zeitung* gives some interesting particulars of remarkable success in indicating the presence of water springs on the part of a man named Beraz, who seems to be a recognized authority in such matters. The scene of his performance was in the Bavarian highlands, at a height of more than 1,300 ft. above the level of the sea. The commune of Rothenberg, near Hirschhorn, suffered greatly from want of water, and invited Beraz, last autumn, to endeavor to find some source of supply for them. He inspected the locality some afternoon in the presence of the public authorities and a reporter of the *Allgemeine Zeitung*, and announced that water was to be found in certain spots at depths which he stated. The first spot was in the lower village, and he gave the likely depth at between 62 ft. and 72 ft., adding that the volume of water which the spring would give would be about the diameter of an inch and a quarter. After incessant labor for four weeks, consisting mainly of rock blasting, the workmen came on a copious spring of water at a depth of about 67 ft. What he declared about a water source for the upper village was very singular. He pointed to a spot where, he said, three water courses were perpendicularly under one another, and running in parallel courses. The first would be found at a depth of between 22½ ft. and 26 ft., of about the size of a wheaten straw, and running in the direction from S.E. to N.W. The second lay about 42 ft. deep, was about the size of a thick quill, and ran in the same direction. The third, he said, lay at the depth of about 56 ft., running in the same direction, and as large as a man's little finger. The actual results were as follows: The first water course was struck at a depth of 27½ ft., running in the direction indicated, and having a diameter of ⅛ in. The workmen came on the second at a depth of 42⅜ ft. It had a diameter of $\frac{7}{32}$ in. The third was found at 62½ ft. below the surface, and having a diameter of ⅜ in.—all three running in the direction Beraz had indicated.

Unfortunately, no hint is given of his mode of procedure."

We have just received from Herr Beraz the following translation from the *Allgemeine Zeitung*, which we give *verbatim et literatim:*

"In spite of the most expensive machinery of pumps we did hitherto not succeed in securing an abundant water supply for our highly situated nunnery, Altomunster, near Roehrmoos, Bavaria, which has now—for the last thousand years—almost uninterruptedly been inhabited by conventuals; consequently we had to struggle with a most painful scarcity of water, even during seasons of moderate dryness. Finally, we applied to the well known spring finder, Mr. Beraz, at Munich; and the result obtained by his intercession is so brilliant that we deem it our pleasant duty to publish it for the benefit of communities and establishments in want of water. On August 12, 1885, in the afternoon, Mr. Beraz indicated to us, in each of our three highly situated convent gardens, a spot covering a subterranean spring; two hours later he reported in writing on his observations. Spot No. 1 covers a well 80 cm. wide, whose strength would be sure to fill a pipe of 1½ in. diameter; spot No. 2, a well as large as a thumb; and No. 3, one as large as a finger, all of which would surely be found at a depth of between 28 and 30 meters, and flowing in the direction from E.S.E. to W.N.W. No external symptom had ever led us to suppose that water was to be found on these spots. Our calamity compelled us immediately to begin at the spring No. 1, indicated as the strongest; rock blasting rendered our work very difficult for several weeks; at last we found, at a depth of 29½ meters, the well indicated, pouring forth crystalline water into the shaft. Careful trials by means of the existing pumps have proved the volumen to be 1½ in.

"We now really enjoy a good supply of pure water for household, agricultural, and piscatory purposes, to such a degree that it gives us much pleasure to propagate the name of Mr. Beraz in order to make it known to the parties still suffering from the want of drinkable water.

"Convent Altomunster, December 9, 1885.

"M. Maximiliana Hirschauer, Prioress, Ord. St. Birg."