ARTESIAN WELLS.

There are three conditions essential to the successful boring of an artesian well: 1, a fountain head more elevated than the locality where the boring is to be undertaken; 2, a moderate downward dip of the strata, toward the site of the well, as a steep angle is unfavorable and permits the water to flow away beyond the reach of the boring, which must needs pass at an acute angle through few layers of rock; 3, alternation of porous and impervious strata beneath the surface soil. It is sometimes the case that the head of water is at so high an elevation that the column bursts forth from the ground as a fountain, throwing up a continual jet. By raising the water above the surface in a pipe, and letting it flow over, convenient water power is obtained. Artesian wells are applied to this purpose at many localities in France, the water they supply being found sufficient to run heavy machinery. From the great depth at which the currents of water are reached, the supplies may be regarded as permanent. A well at Aire, in Artois (from which name the word "artesian" is derived), France, has flowed steadily for a century, the water rising above the surface at the rate of 200 gallons a minute; and at Lillers, in the same country, one well has given a constant yield since the year 1126.

The large engraving (Fig. 1) given herewith represents the artesian well of Grenelle, a suburb of Paris. Seven years and two months of constant labor were devoted to the boring, the rock being extremely difficult to pierce. The water-bearing stratum was reached at a depth of 1,802 feet, when the water was discharged at the rate of upwards of 880,000 gallons in 24 hours. The force is such that the water ascends to a hight of 120 feet above the surface, in the pipes in the elegant structure which has been erected over the bore. The present yield of the well is about 500,000 gallons per 24 hours. The water is at a uniform temperature of 82° Fah., and is used to warm some large hospitals in the vicinity. During the boring, and when at a depth of 1,254 feet, it is related that a drill broke and fell, with 270 feet of rods, to the bottom, necessitating fifteen months of constant labor to remove the pieces.

In the United States the deepest artesian well is that bored for the insane asylum in St. Louis, Mo. This has reached the enormous depth of 3,843 feet, or, in that locality, 3,000 feet below the sea level. This would give a water pressure at the bottom of 1,293 lbs. to the square inch. The deepest bore in the world is one, begun as a rock salt mine and yet uncompleted, at the village of Sperenburg, some twenty miles from Berlin. Its present depth is 4,194 feet. In the Desert of Sahara some seventy-five shafts have been sunk, which yield a aggregate of 600,000 gallons per hour. The effect of this supply is said to be plainly apparent upon the once barren soil of the desert. Two new villages have been built, and 150,000 palm trees have been planted in more than 1,000 new gardens.

In the engravings accompanying this article, from Mr. E. H. Knight's American "Mechanical Dictionary" (published by Messrs. J. B. Ford & Co., New York city), will be found represented a number of the tools used in the operation of boring rock. A common mode of performing this labor is shown in Fig. 2. Two men walk around and turn the handle of the boring tool, which is screwed into an iron rod. In moderately soft ground the weight of the men and the rotation of the handle will cause the boring chisel to penetrate, but in rock it requires to be hammered down. The operation is greatly facilitated by suspending the boring rods from a beam, fixed at one end and worked by a man at the other, assisting, by its elasticity, the efforts of those below in alternately raising and depressing the tool to give it the necessary pounding motion. The hole being thus opened, a valved cylindrical auger, Fig. 3, is introduced. When this is turned, the valve is opened by the pressure of the comminuted rock or earth below, the latter enters the cylinder, and is thus removed.

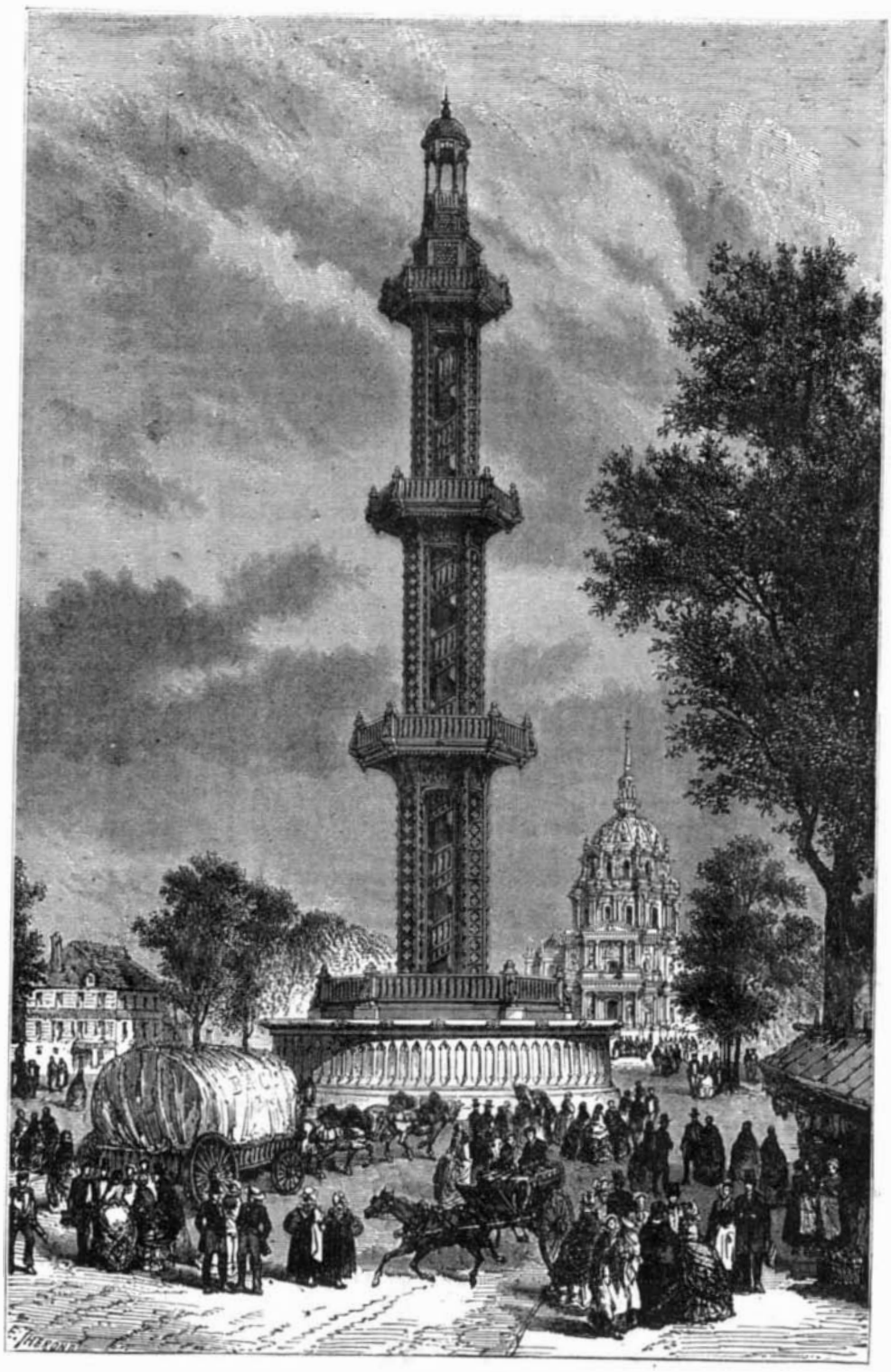
In Fig. 4, *a* is a plan and elevation of an auger used for boring in clay or loam; *b* is an S chisel for hard rock; *c* exhibits a hollow valved auger, for boring through sand or bringing up rock previously pulverized by the chisel; *d* is a spring reamer for enlarging a hole previously bored: this is passed down through the pipe, and, on reaching its bottom, expands to a distance regulated by the screw and swivel connecting the two spring cutters, the cutting edges of which are placed reversely.

Figs. 5 and 6 exhibit different kinds of tools for penetrating earth and rock. The rods frequently break in boring; and for raising the portion broken off below, various devices have been contrived, one of the most simple of which is represented in Fig. 7. It consists merely of a worm, which screws around the rod, which is retained only by friction when lifting. This is available only when the weight of the broken part is insufficient to overcome the friction.

In Fig. 8 the shaft has a point, cutting lips, and a floor on which the earth is received. It is forced into the ground by the screw on the shank, which rotates in a nut at the junction of the legs of the tripod, which is raised above the spot where the auger enters. The end of the screw staff is keyed to a stirrup, in which it turns. Above the stirrup is a coupling piece, having inclined projections fitting in corresponding recesses in the upper part of the stirrup, in such a manner that the shaft is made to operate the screw when boring, while a reverse motion will raise the screw out of the ground without turning it. In Fig. 9 the shaft has a screw point and angular rings, above which is the floor of the dirt chamber. The soil is scooped up by the usual flange, and is elevated in the chamber by the spiral which is braced by the axial rod.

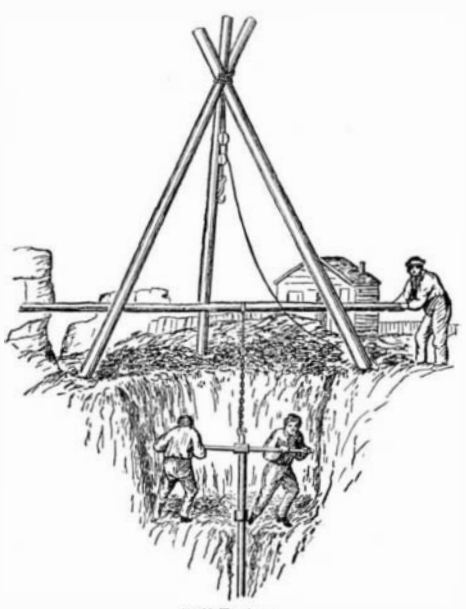
Numerous artesian wells are being sunk along the line of the Union Pacific Railroad, in order to obtain water for the locomotives and for the workmen laboring in the coal mines along the route. The first well is at Separation, 724 miles from Omaha, and the last one is at Rock Spring, 832 miles. It is believed that for agricultural purposes the mineral salts could be washed out of the water obtained from wells in the above vicinity, so that soil irrigated therewith would probably prove remarkably productive. A flowing well, furnishing 1,000 gallons per hour, will water a section of 640 acres. If bored 1,000 feet in depth, the cost would be about $10,000. Out on the plains this outlay would make a most productive farm, which might be made the nucleus of a stock range of thousands of acres, having besides an ample supply for human consumption.

Fig. 1.



ARTESIAN WELL.
GRENELLE, PARIS, FRANCE.

Fig. 2.

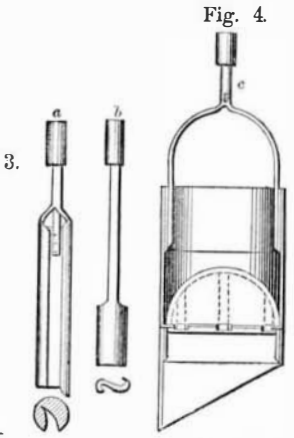


Well-Boring.

Fig. 3.

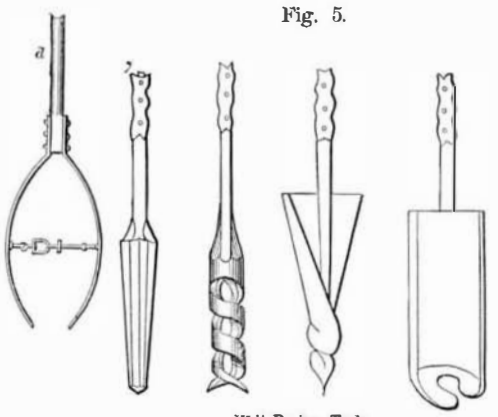
Hole-Cleaner.

Fig. 4.



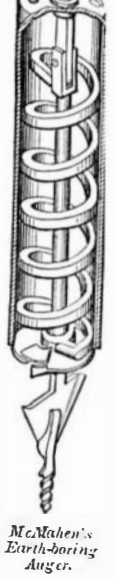
Well-Boring Tools.

Fig. 5.



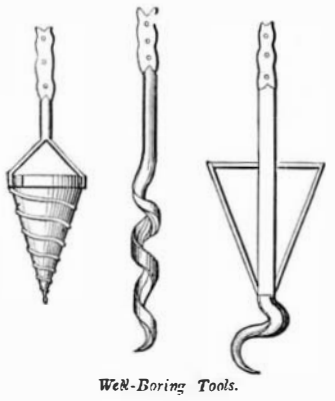
Well-Boring Tools.

Fig. 6.



McMahen's Earth-boring Auger.

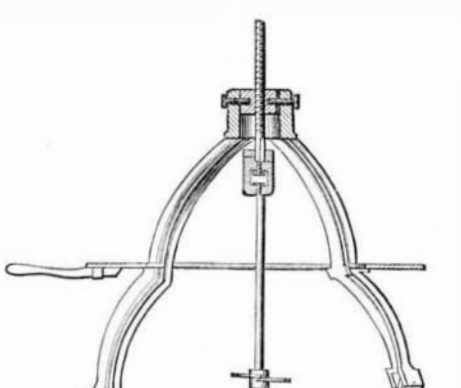
Fig. 7.



Well-Boring Tools.

Rod-Lifter.

Fig. 8.



Earth-boring Auger.

The Electric Light for Locomotives.

Experiments with the electric light as a head light for locomotives have recently been made in Russia on the railroad from Moscow to Kursk, with successful results. The apparatus consisted in a battery of 48 couples, which produced sufficient illumination to light up the track for a distance of from fifteen to eighteen hundred feet ahead.

A correspondent of *Les Mondes* suggests that a small electric machine would serve the purpose much better than a galvanic battery, liable to injury by agitation. It is proposed to connect the mechanism directly with the front axle, the revolution of which will set the former in operation. The chances of danger usually augment with the speed; but arranged as above described, the intensity of the light would increase in like ratio, up to certain limits. In running slowly, the illumination would be comparatively feeble; but in such case the bell, whistle, and other signals would afford warning in ample time.

THE FINCHES.

One of the most interesting of the numerous families of birds consists of the various species of finch, of which the canary is the best known in this country. In our engraving the chaffinch, the yellowhammer, the goldfinch, the linnet, and the crossbill are shown, and there are many others, the bulfinch, the greenfinch, etc. The goldfinch and the yellowhammer have very brilliant plumage, and, with the linnet, are excellent songsters. The linnet's note is not so powerful as that of the canary, but it is sweet; and the bird, when brought up near a good singing canary, becomes a very accomplished vocalist. The goldfinch and the chaffinch build nests of exquisite workmanship, the latter's domicile being nearly globular in shape, with an entrance at the side.

Most of the finches are very docile, the bulfinch and goldfinch being susceptible to an advanced education. Mr. Syme, an eminent British naturalist, describes some trained birds of this species, one of which appeared dead, and was held up by tail or claw without moving; a second would stand on its head; a third would walk about with little pails at his side, like a milkmaid; a fourth imitated a girl looking from her casement; a fifth acted as a soldier with his firelock; a sixth would fire a cannon, and go through the motions of an artilleryman. It has been known to live twenty-three years in confinement.

The crossbill has a singular conformation of the beak, the mandibles crossing each other like a pair of scissors; and the facility with which it opens the pine cones, for the sake of the seed, on which it principally feeds, is surprising. It is not found much in the south of England, except in captivity, but it frequents the pine woods of Scotland and the north of Europe. As a cage bird it is very amusing, and from its movements might be called the European parrot. The peasants of Germany have a tradition that its bill was twisted in an attempt to extract the nails from our Saviour's cross—a legend which Longfellow has embalmed in an exquisite poem. The bird being very shy, not much is known of its habits in a wild state.

NESSLE'S STREET RAILWAY RAIL.

In the invention herewith illustrated, the rail is divided horizontally, about through its center. The lower half is first bolted on the stringers, and the upper half is laid on it, so as to break joints with the lower half, the bolt holes being slotted sufficiently to allow for contraction and expansion, making substantially a continuous rail, thereby avoiding the bending and battering which is found to be so destructive to the rails and the rolling stock. The greatest advantage is that, when the upper half is worn out, it can be removed, and thus only these top halves need be renewed.

Fig. 1

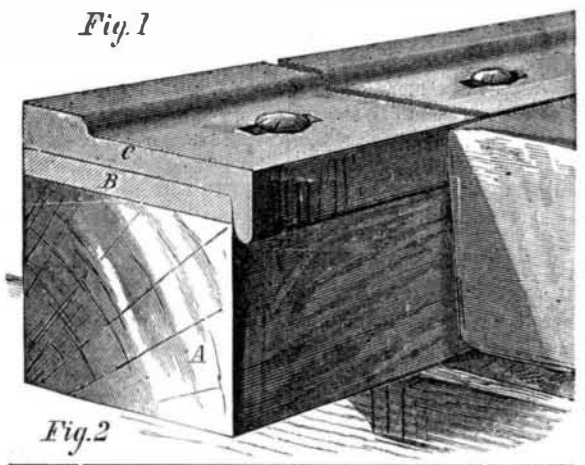


Fig. 2

A, in the engraving, is the timber ordinarily laid down to form the base for the track. On this is secured the lower half rail, B; and on it the upper half, C, is bolted so as to break joints with the under halves, as before explained.

Patented May 4, 1875. For further particulars address the inventor, Mr. John P. Nessle, 23 Frelinghuysen avenue, Newark, N. J.

The Duplexed Telegraph Printers.

The experiment of working the combination printing telegraph apparatus in duplex, between this city and Boston, has proved to be a complete success, and will probably result in the extensive use of printers on the Western Union line. The quadruplex arrangement of circuits is used, although only two circuits are worked by the printers, the other side, which, with the Morse instruments, is used for operating circuits, being utilized for breaking the sending circuit when required. By this arrangement neither circuit interferes with or interrupts the other, as is the case with the quadruplex Morse.

The operators are delighted with the new arrangement, and say they can work faster and more easily than with the old arrangement or single circuits. In one day recently, one thousand messages were transmitted over a single wire between this city and Boston, employing four operators only, and doing as much business as could have been accomplished by quadruplex Morse circuits and eight Morse operators, on the same wire in the same time.

This improvement is likely to open up a new and successful future for printing telegraph instruments, which had been somewhat out of favor of late years, and have heretofore been used only to a limited extent.—*The Telegrapher.*

Singular Explosion.

At the works of Hewes & Phillips, Newark, N. J., a few days since, it became necessary to remove the rings from a steamboat piston, which was hollow, with two sets of packing rings. The rings were found to be rusted and corroded fast, and the piston was placed on a fire in the blacksmith shop to loosen them by heat. In a few minutes an explosion occurred, and the piston was blown to pieces, injuring one man so that he died in a few minutes, and hurting another badly about the face. On a close examination of the pieces, it was believed that marks of an old crack were found. It is thought that, when hot and under pressure, some steam may have leaked through into the piston and subsequently condensed, and the crack may then have been rusted tight. When the piston was heated, this water inside became converted into steam and caused the explosion.

THE following is a good recipe for raspberry vinegar: Pour over 1 pound of bruised berries 1 quart of the best cider vinegar; next day, strain the liquor on 1 pound of fresh ripe raspberries, bruise them also, and on the following day do the same. Do not squeeze the fruit, only drain the liquor thoroughly. Put the juice into a stone jar and add sugar in proportion of one pound to a pint. When the sugar is melted, place the jars in a saucepan of water, which heat; skim the liquor, and, after it has simmered for a few minutes, remove from the fire, cover, and bottle.

PROFESSOR WILLIAM HAGEN, of the Academy of Civil Engineers, Berlin, predicts the failure of the jetty system, now being constructed at the mouth of the Mississippi, and declares that the large amount of money, appropriated by Congress for that work, will be a total loss.

MEMBERS OF THE FINCH FAMILY.