

The sun crosses each meridian every four minutes; the time for the meridians to the east from the central station is therefore, for every degree, always four minutes earlier, and for meridians to the west four minutes later, than it is at the central station. Four minutes for 46 miles, or two hundred and forty seconds for 241,040 feet, is at the rate of 1,000 feet for one second: a velocity a little less than that of sound. So that the propulsion of the air wave, when going directly west, would slightly overtake the solar movement; and if sent at noon from the central station, it would arrive at a western station before the sun passed the meridian of such western station. If we make the calculation for the latitude of New York city, we come to the curious result that the wave of compressed air, or the sound wave, travels west at the same rate as the sun does; as, in our latitude, the degrees of longitude have a length of nearly 50 miles, which is passed over by the sun in four minutes, being at the rate of 262,000 feet in two hundred and forty seconds, or very nearly 1,100 feet per second. Therefore, if a pneumatic system of transmitting time were adopted here, the impulse would, in tubes running directly from east to west, be transmitted at the same rate as the solar motion, and a wave sent from Brooklyn at noon would arrive in five seconds in New York, where it would then be exactly noon; and it would arrive in Jersey City in another five seconds, where the sun would then cross the meridian, and so on, traveling west and keeping pace exactly with the solar time.

THE UTILIZATION OF RATS.

Most people have an instinctive aversion to rats, classing them with snakes, bedbugs, mosquitoes, and other evils of this world, allowed to exist by an inscrutable Providence for reasons past human discovery. Beyond having a vague knowledge that the heathen Chinese devours the murine tribe, and deems the unsavory-looking rodent a delicacy, the average thinker on the subject can perceive no utilization for the vagrant denizen of cellars and wharves, save (indirectly) in his furnishing an object to be caught by the multiplicity of ingenious traps which inventors have constructed, and serving as a source of perpetual nervousness to the wiry Scotch terrier who spends his days in searching for him under parlor sofas, behind furniture, and in every other shady corner where the illogical canine mind conceives a rat might possibly shelter himself. The fact of the case is that the rat is in reality a useful animal; and as we showed recently in a discussion on bedbugs, it is a violent assumption for anyone to suppose that any living thing does not serve, or may not be made to serve, a useful purpose. Moreover, it is equally erroneous to assert that a rat is a noxious beast. To be sure, he breeds with astonishing rapidity, and he has the failing of cannibalism toward his progeny. But so has his arch enemy, the well fed tom cat. He is pugnacious, but rarely attacks man save in defence of his life. On the other hand, he is scrupulously neat, even more so than the average male feline. As a scavenger, his labors are of great value in the filthy cities of the Orient; and his tail is a marvel of constructive design and a source of perpetual admiration to the anatomist. Unfortunately he is a pronounced kleptomaniac; and this, with his supposed proclivity to take refuge in the vicinity of female ankles, makes him a pariah and an outcast among four-footed things. Yet mark the inconsistency: On the fair hand of the damsel, who shrilly shrieks at the sight of that wonderfully constructed tail whisking into a friendly hole, may be a glove—or at least the thumb of it—made from that despised creature's skin, and called by courtesy a "kid." On the head of paterfamilias, who ruthlessly pursues the fugitive interloper with the kitchen poker, may be a felt hat made from the rat's fur, which exceeds in delicacy that of the beaver, and which is sought after by a large corporation, expressly organized for the purpose, in Paris. An eccentric Welshman once, in order to show how far the rat might be utilized for clothing, spent three years in collecting enough ratskins to make himself a complete dress, hat, neckerchief, coat, waistcoat, trousers, and even shoes; six hundred and seventy rats were immolated for this purpose, and the six hundred and seventy beautifully organized tails were strung together to form a tippet.

It is in Paris—that home of the utilization of everything—that the rat is turned to the greatest number of uses. He furnishes employment for an army of hunters, who pursue him in his sewer fastnesses for the sake of his skin. In the great abattoirs of the city rats exist by the million. One proprietor, on becoming nearly driven from his premises by the rodents, threw a dead horse in a walled inclosure, and then stopped up all means of escape, so that the rats, attracted by the bait, could not get out. In one night 2,650 rats were caught in the trap and killed by men armed with clubs; in a single month, 16,050 of the animals were thus destroyed. We note this case mainly in connection with a curious utilization of rats, wherein dead animals of all kinds are placed where they can get them as an easy way of disposing of the refuse flesh and securing the valuable bones. A regular pound, surrounded by a massive stone wall, is provided for this purpose by the city authorities of Paris, and it is the regular morning's work of those in charge to remove the beautifully polished skeletons.

Of course, when thus pampered, the rats multiply amazingly, and therefore once in a while a grand battue is necessary to reduce their numbers. The way in which this is conducted is curious. Horizontal holes are bored all around, in and at the foot of the inclosing walls, the depth and diameter being respectively the length and thickness of a rat's body. Upon the morning of the battue, men armed with tin

pan, kettles, drums, and other objects for producing horrible noises, rush in at daybreak. The astonished rats precipitately rush for the nearest openings, which are those in the walls. But these, while large enough to contain their bodies, will not accommodate their tails, and the walls are soon ornamented with a vista of those anatomically superb members, whisking about like animated icicles. Then arrives the rat collector—a scientist in his way—who, with admirable dexterity, seizes the pendent tails, jerks forth the owner attached thereto, and deposits him in a bag worn over the left shoulder. The privilege of catching the rats is farmed out by the authorities, and a profitable business it is. The rats are sleek and fat, and fetch high prices for their fur, skins, and flesh—the latter doubtless appearing in the restaurants where one may have "dinner for one franc with wine, bread at discretion." Rat flesh is not bad eating, at least so say those who have tried it, our knowledge in the matter being limited. It is delicate, white, firm, tastes like chicken, and in China the soup made from it is considered to be equal to our well known oxtail. In the Celestial Kingdom rats are worth two dollars per dozen. In the West Indies the rats exist in enormous numbers on the sugar plantations, and work great damage by gnawing the growing sugar cane. Each plantation has its official ratcatcher, who is paid by piecework, that is, so much a dozen for tails brought in.

The credit of suggesting the most extensive utilization of rats is due to Mr. P. L. Simmonds, who has lately printed an admirable work on these and other undeveloped sources of profit—from which we have drawn many of the curious facts above given. Mr. Simmonds suggests that a profitable venture might be made from Kurrachee to Canton and Hong Kong of salted rats. About 7,000,000 could be cured and packed aboard a 400 ton ship. For the sake of curiosity we quote Mr. Simmonds's estimate of profits: 7,000,000 rats at 6 cents per dozen, \$35,000; salting, curing, etc., 60 per cent, \$21,000; total cost, \$76,000; and 7,000,000 rats sold at \$2 per dozen, \$1,166,666.66, shows a profit of \$1,090,666.66. There! No one can charge us—thanks to Mr. Simmonds—with not having done our best to enrich our readers. Few journals can claim the proud laurel which we boldly now grasp, of having pointed out the way for anyone to become a millionaire.

A FIFTY THOUSAND DOLLAR BOTCH THAT THE PEOPLE PAID FOR.

There will be found, recounted with much detail, in the recently issued report of the Chief of Ordnance of the United States army, about as glaring and inexcusable an instance of waste of the people's money, through a series of mechanical blunders, as can probably be found in the already long category of expenditures for fruitless tests of military inventions. Fifty thousand dollars have been squandered in an attempt to manufacture one 9 inch cannon according to the plans of Mr. Alonzo Hitchcock. The story of the various botches and mistakes, which we summarize briefly below, would verge upon the laughable, were it not well calculated to render any thoughtful mechanic ashamed of the men who did the work, as well as of those who permitted it to continue in the manner recounted for a period of over two years.

The Hitchcock system of cannon making is based on the welding together of a number of wrought iron rings, which are seated on an anvil located upon the piston of a hydraulic press. The latter is lowered as the rings are added, and a furnace is provided for keeping the rings hot while being hammered. In this way a gun is gradually built. This description is very general, but it will serve to convey a sufficient idea of the invention to appreciate what follows. Early in February, 1873, Mr. Hitchcock was granted an appropriation of \$50,000 for the manufacture of his gun at the Springfield armory, and given the supervision of the work; and every opportunity was afforded him for making the most careful studies. But so vague were his plans at the outset that he neglected even to have working drawings made of a part of his plans until the mechanics had actually begun labor thereon. The preparations consisted in blasting a pit 40 feet deep into the solid rock, lining it with concrete, and afterwards with a huge iron tank. Two months later, after a part of the ponderous machinery above this had been erected, Mr. Hitchcock concluded to cut the holes, which received his steam hammer supports, down four feet. This was then a very slow and difficult operation, as blasting, owing to the concrete, could not be resorted to. Finally, in August, 1874, the hammer was built, and steam was let on; but the machine refused to work. The hammer bound against the steam cylinder, and unlimited filing of shafts became necessary. "Had Mr. Hitchcock made a careful inspection of these machines when he visited the ironworks for that purpose," the reporter says, "this would not have happened." Then it was discovered that, through a blunder, the anvil pit was not deep enough, and more alterations had to be made.

By April, 1875, more than two years after the work had begun, the furnaces were furnished, and tested satisfactorily, and preparations were made to heat one of the gun disks. Prior to beginning work, tests were made of the water bottom on which the disks rest in the furnace; but through some stupidity, the exhaust valve of the same was closed, so that steam was generated, which drove back the water in the supply pipe. Thereupon "somebody," in a state of great excitement, opened the valve suddenly, relieved the steam pressure, in poured the cold water, and of course the water bottom cracked. The diary of the ordnance lieutenants en-

gaged upon the work now becomes amusing reading. We quote a few extracts: "April 7. Mr. Hitchcock proposes to make a false bottom of sand." "April 8. Tried to resolve piece in heating furnace through the door with a wrench-shaped tool. Piece stuck on hearth, and gaspipe handle grew soft by heat, and bent. Hammer accidentally dropped on the furnace lid crane, which was standing directly under it. Mr. Hitchcock at the throttle." "3:25 P.M. The top piece" (suspended in hammer furnace) "is lowered; it strikes one of the corners of the cast iron center, melts the corner, and topples the piece over. 3:28 P.M. Fortunately by this time it is too cold to stick. 3:35 P.M. It is decided to draw fires." Mr. Hitchcock decides that a cast iron water bottom is essential; but two days later he changes his mind, and concludes to tinker the old cracked bottom with an iron hoop. This promptly burst on being used, and the inventor set about making a wrought iron water bottom, having a locomotive tire for a rim. This was made and inserted, and operations now progressed to the welding of several disks—not, however, without an interesting variety of accidents which we shall not recapitulate. The sixth piece to be added was accidentally dropped, and the unfortunate water bottom was again damaged, and caused to bulge and leak. The pieces welded were cut up and the welds found bad. More alterations of the machinery followed, and at last, in June, fires were again started; but, to quote the official report again, "Mr. Hitchcock dropped the hammer upon the first ring, and found himself unable to raise it again." The anvil had not been properly adjusted, the hammer fell too hard, and away went the cylinder head. Two weeks later, another attempt was made to weld together two large disks to form the breech of the gun. But "the hook at the end of the chain sustaining the transfer tongs became heated, and straightened out, allowing the upper disk to fall. Before the disk could be placed in proper position, it had become chilled, had to be reheated, and finally a weld was made; but this, on examination, was again found to be exceedingly bad."

We have given the above in some detail in order to exhibit to the reader the placid effrontery with which Mr. Hitchcock, in his letter dated June 24, 1875, declining to proceed further with his gun, explains the reasons for this grand series of botches and blunders. We quote *verbatim*: "Notwithstanding the machinery, all works satisfactorily; I find that, by practical operation, there is great danger of uncertainty about the old reverberatory furnaces, which we now have in the works. This was, however, well understood by the Ordnance Board; and all practical furnace men knew that there are better furnaces in use, as, for instance, the gas or Siemens' regenerative furnace; but simply for prudential motives, it was deemed sufficient to test my mechanical mode of welding up guns as I proposed, leaving the furnaces to future consideration if the machinery would do the work, as was promised. We are trying to make impossible things possible, and going squarely in the face of all known facts in science and practical knowledge that have been developed within the last ten or twelve years."

Mr. Hitchcock makes these statements after two years and nine months' experiment, and after the \$50,000 of the people's money is all but exhausted. With reference to them, Colonel Benton says: "All parts of his gun machinery, including the furnaces, were designed by Mr. Hitchcock, and were constructed under his immediate supervision and without limitation in the selection of the nature of the furnace." Further comment is needless.

Explosive Compounds.

Two more instances of unexpected decomposition, accompanied with some degree of violence, have lately been brought to our notice. The first happened with iodide of strychnia: a bottle, in which some of the salt had been long kept, was held near the fire, to warm the glass and loosen the stopper. An explosion suddenly occurred, scattering the glass and badly wounding the hand. The other accident was related by Mr. B. F. McIntyre, at a meeting of the Alumni Association of the New York College of Pharmacy. On distilling essential oil of bitter almonds over nitrate of silver, to free it from prussic acid, toward the end of the operation the material in the retort violently exploded, breaking all the glass apparatus in the proximity, but doing no further damage. Neither explosion can be very easily explained; in fact, few explosions can, except in a general way. In regard to the iodide of strychnia, it is supposed that the substitution compound had formed, on decomposition, some iodide of nitrogen, in a somewhat similar manner to the production of that substance when iodine is treated with an excess of ammonia. As to the reaction which occurred between oil of bitter almonds and argentic nitrate, it may be said not to be altogether extraordinary, as the silver is known to readily form explosive compounds with a number of organic substances. The only wonder is that no mention has been made of it before this time, for the rectification of the essential oil over nitrate of silver is not an unfrequent operation, while it seldom happens that one has occasion to heat old iodide of strychnia.

To Protect Molten Lead from Explosion.

Molten lead, when poured around a damp or wet joint, will often convert the water into steam so suddenly as to cause an explosion, scattering the hot metal in every direction. This trouble may, it is said, be avoided by putting into the ladle a bit of rosin the size of a man's thumb, and melting it before pouring.