

simply wiping with the bare hand. Still further tests consisted in thoroughly rusting the breech mechanism, and then firing the arm in this condition, while yet other tests were made by using defective cartridges in the gun, to determine its liability to being permanently disabled from such cause, as occasionally happens in actual service.\*

From the first, the board made every possible effort to induce American inventors to enter these competitive trials, desiring especially to secure for the service an arm of distinctly American origin. And it was the general expectation at the outset that American inventors would lead all others in this field, but the guns of home design presented, although containing many highly ingenious features and some special merits of high character, were generally found wanting in the combination of qualities which had been decided upon as the standard. The delay of inventors in presenting their arms caused an undue prolongation of the work of the board, some of the arms tested being withdrawn several times for correction and improvement. There is reason to believe that a knowledge of the rules laid down by the board, and a general understanding of the manner in which these exhaustive tests were conducted, will have the effect of stimulating American inventors to making renewed efforts in this line.

Among the other guns tested by the board which made a remarkably good showing, notwithstanding the severity of the trials, was one presented by the inventor, Mr. L. F. Bruce, of Springfield, Mass., of which we give a sectional view of the breech mechanism, with the action open and magazine full. The left wall serves as a guide and support for the long rib, *a*, of the bolt, and in front the casing, *b*, considerably overhangs the receiver with a helicoidal surface, *c*, which, when the nose, *d*, of the guide rib comes into bearing, cams the bolt around to the right. A channel, *e*, in the tang permits the passage of the cocking piece, *m*. The magazine is a hinged box revolving down and to the rear, and it can be cut off and held in reserve while the gun is used as a single loader.

In the tests of this gun 15 shots were fired as a single loader in 55 seconds, the magazine being then turned on and its five shots fired in 15 seconds. Thirty-six shots were then fired, using the gun as a single loader, in two minutes, 38 shots being fired in two minutes at another trial. As a single loader the fire was more rapid than as a magazine loader. In the endurance trial the bolt worked stiffly as the gun became heated toward the close of each set of 50 shots, and some minor but apparently easily remediable defects were disclosed. The dust test also disclosed some defects, there being difficulty in extracting shells, and the mechanism working stiffly. No injury was done to the piece by the use of defective cartridges, or by excessive charges, but the mechanism always required the exertion of considerable force to operate it.

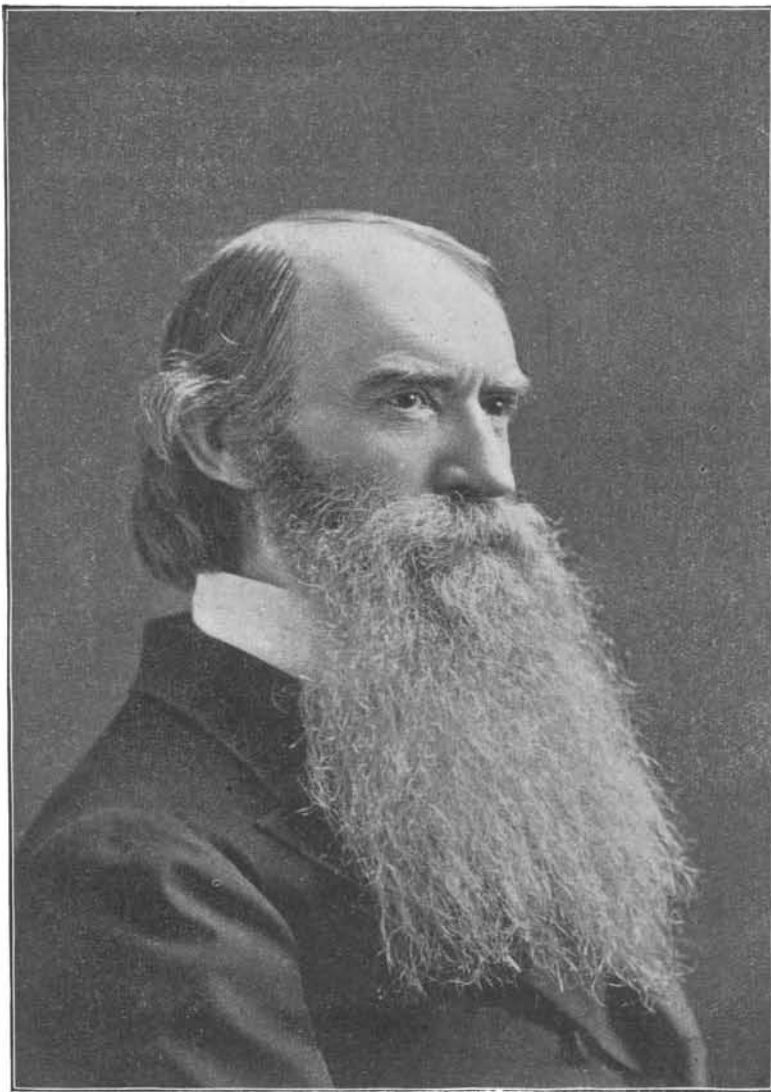
The "Hampden" arm, shown in section with the action opened in one of the illustrations, is so named in honor of Hampden County, Mass. It was submitted by the inventor, Mr. Thomas B. Wilson, of Springfield, Mass., and showed wonderfully good qualities when subjected to the prescribed tests. The magazine mechanism, including the cut-off, is entirely contained in the cartridge packet, which is placed in a receptacle to the left of and above the receiver. The latter is cut away at the right side, having a straight shoulder, *a*, upon which the long guide and locking rib of the bolt rests when ready for firing.

In the tang is a channel, *e*, for the passage of the nose of the cocking piece, *h*, and the extractor, *d*, has hooks engaging over the body of the bolt and the sleeve assembling the parts of the bolt. In the top of the cartridge packet is a folded leaf spring, *y*, one end secured under a cross bar, *r*, while the other end acts as a follower, the weight of the cartridges assisting the action of the spring. The cut-off, *g*, is a flat piece of spring steel sliding in the socket, *i*. From the position and form of the cartridge packet, by simply using larger packets a greater number than five cartridges can be introduced into the magazine, the number being limited only by the convenience of handling the packets and the amount of projection above the gun.

In the first test 15 shots were fired as a single loader in 54 seconds, followed by the 5 shots from the magazine in 15 seconds. Forty-five shots were then fired in two minutes, using the piece as a single loader. In testing the piece for two minutes as a magazine arm, six trials were made, on account of various mishaps, the last trial resulting in 50 shots being made; and in

firing from the hip at short range, 30 shots were made and 5 cartridges introduced into the magazine in one minute. Throughout the 500-round endurance test the mechanism worked well, and also as a single loader for 100 rounds. The gun also worked well after both dust tests, with the magazine loaded and empty when exposed, and defective cartridges and excessive charges in no way affected the mechanism, which worked freely and well and to the satisfaction of the board. After rusting the bolt had to be opened with a mallet, and the firing pin was rusted fast, so the gun could not be fired.

The other American guns submitted to the board included one by John H. Blake, of New York City, in which the magazine, lying below the receiver, contains a revolving cylindrical packet holding seven cartridges; a gun by the Chaffee-Reece Arms Co., of Washington, D. C., with a tubular magazine carrying five cartridges in the butt stock; one by M. H. Durst, of Wheatlands, Cal., having a cylindrical ten-cartridge magazine lying directly below the receiver, the cartridges being loaded singly or stripped from a clip as with the Mauser gun; one by Ivert Larsen, of Chicago, with five-cartridge magazine and cut-off; one by J. W. Mullins, of Fariston, Ky., in which the magazine is designed to hold but three cartridges; one by Major W. R. Livermore and Captain A. H. Russell, of the United States army, very similar to the Lee-Speed gun of England; and



PROF. NEWBERRY.

one by Arthur Savage, of Brooklyn, N. Y., with a magazine adapted to carry nine cartridges.

Before the question of selecting the best breech mechanism was submitted to the board, the War Department had fixed upon 0.30 of an inch as the caliber of the new rifle, instead of 0.45 of an inch, the old standard. It had also settled upon the length of the barrel, the twist of the rifling, the number and form of grooves, and the dimensions of the chamber corresponding to the new cartridge, which will have a bottle-necked shell, and will, when loaded, be 3.09 inches long. The bullet will be 0.309 inch in diameter and weigh 230 grains; it is made of hardened lead incased in a jacket of copper. A charge of 36 grains of smokeless powder is to be used, giving an extreme range of 4,000 yards, or a range of some 1,500 yards with a very flat trajectory. The smokeless powder used on the trials came from Wetteren, Belgium, but we already have a smokeless powder, perfected by officers in the service, which has many superior points, and is thought to be fully equal to any of the smokeless powders heretofore made in Europe.

The report of the board, forwarded to the War Department in September last, approved by the chief of ordnance and the Major-General commanding, has also received the approval of the department, and in November orders were issued for the commencement of work upon this new United States magazine rifle at the gun shop of the Springfield Armory. A great amount of preparation is necessary before it will be

possible to turn out the guns rapidly in quantities sufficient to supply the army, much of the present machinery having to be materially changed and considerable new machinery having to be supplied, but this work of preparation is now well under way. It is being energetically pushed under the immediate direction of Captain S. E. Blunt, of the ordnance department of the army, who was the recorder of the board, and who has a national reputation as being one of the most competent officers in the service in all matters pertaining to the manufacture, handling, and use of small arms. It is expected that deliveries of the new arm to the army will commence about June or July, 1893.

#### JOHN STRONG NEWBERRY.

The present year will be long remembered in the history of the National Academy of Sciences by the large number of deaths among its distinguished members. Scarcely had 1892 been ushered into existence when the loss of the venerable Quartermaster-General Montgomery C. Meigs was made known. In quick succession came the announcements that the physicist Lovering and the chemist Sterry Hunt were no more. The botanist Watson and the astronomer Rutherford died before the year had reached its fullness. In the early autumn the engineer Trowbridge died, and now, as the year is fast drawing to a close, death claims as its victim one whose genius placed him easily among the very first of our geologists.

John Strong Newberry was born in Windsor, Conn., on December 22, 1822. His ancestry was thoroughly American and his grandfather served with distinction in the revolutionary war, attaining a high rank in the army. At an early age the boy accompanied his parents to Ohio, and, as he grew up, determined to study medicine. Accordingly he entered the Western Reserve College, where he was graduated in 1846, and two years later received his medical diploma at the Cleveland Medical College. This education he supplemented by two years in Europe, where, besides pursuing special studies, he visited the great capitals.

Few men at that period were able to begin a professional career so well equipped in every respect as young Dr. Newberry. The city of Cleveland was, even in those early days, a large place and was beginning to feel the prosperity that came to it in consequence of the building of Western railroads. Perhaps more than any other city in Ohio it was a social center, and in 1851 Dr. Newberry settled there in the practice of medicine. For four years he was active in his profession, but his scientific researches were steadily leading into those branches which subsequently became his life work.

Soon after the discovery of gold in California, the desirability of a transcontinental railway was agitated, and the selection of a suitable route was one of great importance. The national government took an active interest in the matter, and during the years 1853-6 no less than five separate lines of geological reconnoissance were in active operation in different sections of the country west of the Mississippi River. To a young and enthusiastic student of natural history, here was a new and great field to be studied. James D. Dana and Philip T. Tyson had made brief reports on the geology of Cali-

fornia, but otherwise it was a *terra incognita*. Accordingly, in 1855, Dr. Newberry joined the United States army as an assistant surgeon, and in that capacity, but with charge of the geology, he was assigned to the exploring party sent out under command of Lieut. Robert S. Williamson, to examine the country between San Francisco and the Columbia River. He gathered information on the botany, geology, and zoology of the territory visited, and his reports appear in the sixth volume of the "Reports of Explorations and Surveys to ascertain the most Practical and Economical Route for a Railroad from the Mississippi River to the Pacific Ocean, made in 1853-6," which was published in Washington in 1857.

The work proved congenial, and, promptly on finishing his report, he joined the expedition under Lieut. Joseph C. Ives, assigned to the exploration and navigation of the Colorado River. With this party he entered the river at its mouth and ascended the turbulent stream by steamer some five hundred miles, until the entrance of the Grand Cañon was reached, where he spent nearly a year in making researches in the geology and natural history of that territory. His observations formed the most interesting material that was gathered by the expedition, and more than one-half of the "Report upon the Colorado River of the West, explored in 1857-8," issued by the government in 1861, was written by him. It was doubtless the interest aroused by this account that ten years later led Major John W. Powell, now director of the United

\* An illustrated description of the manner in which these tests were carried out was published in the SCIENTIFIC AMERICAN of August 22, 1891.

State Geological Survey, to make his famous exploration of the great cañons of the Colorado.

When the war broke out he was elected a member of the U. S. Sanitary Commission, and was instrumental in extending the work of the commission throughout the Western States. After the war was over, he was called to fill a chair of geology and paleontology in the then recently established School of Mines of Columbia College, on the duties of which he entered in the autumn of 1866. In this capacity he continued until December, 1890, when a sudden stroke of paralysis compelled him to relinquish work. A year's leave of absence was promptly granted him, but at the expiration of this term he was unable to return, and he was made professor emeritus.

He was appointed paleontologist to the United States geological survey in 1884, and assigned to the charge of certain portions of fossil botany and fishes, concerning which he reported on the "Fossil Fishes and Fossil Plants of the Triassic Rocks of New Jersey and Connecticut Valley" (Washington, 1888), and on "The Paleozoic Fishes of North America" (Washington, 1889). Material on the fossil plants of the cretaceous and tertiary rocks of the far West was for some time in his possession, but had not been sufficiently completed for publication up to the time of his death.

Of honors he had many. In 1867 the degree of LL.D. was bestowed on him by the Western Reserve College, and in 1888 the Geological Society of London conferred upon him its Murchison medal, which was the first time this honor had been bestowed upon an American geologist. It was then well said of him that "He is a geologist after Murchison's own heart—keen of eye, stout of limb, with a due sense of the value of detail, but with a breadth of vision that keeps detail in due subordination."

In his death science loses one of its masters, for he was rich in those accumulated experiences which we call wisdom. Humanity loses a friend, for seldom has a life been spent in more active philanthropy; but his influence cannot die, and will live to

"Reach thro' nature, moulding men."  
—M. B.

#### Draining of Lake Angeline.

Lake Angeline, in the Marquette Range, was a little lake near Ishpeming, Mich. The Cleveland Iron Mining Company and the Lake Superior Iron Company owned together about four-fifths of the area of the lake. The rest was owned by the Pittsburg and Lake Angeline Company. The lake was a beautiful sheet of water nearly a mile long, one-third of a mile wide, and about forty-five feet deep in a number of places. Its average depth was 20 feet. The operations of the mining companies have for some time extended beneath its bed, and it was determined by the mining companies to

drain it. Operations were begun last spring, the contract being awarded to C. B. Howell, of this city. The work began with sinking a crib and putting in operation a centrifugal pump, with 20 inch suction and 22 inch discharge, and a capacity of 15,000 to 20,000 gallons per minute. The water was discharged into the Carp River. A few days ago the work was brought to a successful culmination. The lake, of 800,000,000 gallons estimated capacity, was emptied, and a handsome profit is expected as the result of the operation.

#### A LION AT LARGE.

The accompanying illustration represents an incident which lately occurred in the streets of Bordeaux. A traveling menagerie had taken up its quarters on the Boulevard de Cauderon, on the outskirts of the city near the Parc et Jardin d'Acclimatation, and, during feeding time, one of the lions managed to evade the keepers and escape from his cage. The wild beast tore down the spacious boulevard to the consternation of the passers by, and suddenly turned into a by street. Here he observed, outside a tavern, a sleepy cart horse

The firing does not seem to have injured the lion, for as soon as he had had his fill of horse flesh he turned to continue his promenade. At this moment a young man proposed to attempt to lasso the beast, and covered by the revolvers of the *gens d'armes*, he made the attempt. After many futile efforts, the noose eventually fell about the neck of the lion, and, being pulled tight by the excited crowd of pursuers, the animal was dragged, half-strangled, back to his den. It was fortunate that the cart horse was the only victim of this unusual excursion.—*Daily Graphic*.

#### Antiquity of the Saw.

The saw is an instrument of high antiquity, its invention being attributed either to Dædalus or to his nephew Perdix, also called Talos, who, having found the jaw of a serpent and divided a piece of wood with it, was led to imitate the teeth in iron. In a bass-relief published by Winckelmann, Dædalus is represented holding a saw approaching very closely in form to the Egyptian saw. St. Jerome seems clearly to allude to the circular saw, which was probably used, as at present, in cutting veneers. There are also imitations of the use of the center bit, and even in the time of Cicero it was employed by thieves. Pliny mentions the use of the saw in ancient Belgium for cutting white building stone; some of the oolitic and cretaceous rocks are still treated in the same manner, both in that part of the Continent and in the south of England. In this case Pliny must be understood to speak of a proper or toothed saw. The saw without teeth was then used just as it is now by the workers in marble, and the place of teeth was supplied, according to the hardness of the stone, either by emery or by various kinds of sand of inferior hardness. In this manner the ancient artificers were able to cut slabs of the hardest rocks, which consequently were adapted to receive the highest polish, such as granite, porphyry, lapis-lazuli, and amethyst.



AN ESCAPED LION ATTACKS A DRAY HORSE.

harnessed to a hay cart, and evidently awaiting the return of its driver from the *estaminet*. Although pursued by his keepers and a crowd of police, the lion at once flew at the horse and fixed his jaws into its neck. The poor beast plunged and kicked, but it was of no avail, and while he neighed piteously the police began firing with their revolvers at the struggling pair.

without risk; but with the conductors of the arc lights, where, as is usually the case, there are a number in series, a severe shock may be experienced on touching the wire, and if a ground connection existed by chance elsewhere, and some other conditions were present by which the full force of the current passed through the body, this shock might be fatal.

#### Carrying Capacity of Wires.

The safe carrying capacity of a wire is that current which it will convey without becoming painfully warm when grasped in the closed hand. In reference to this it must be remembered, says the *Electrical Age*, that this test cannot safely be made with the wires carrying currents for arc lights, and it is intended to be applied only with reference to the conductors of incandescent lights. These may be handled

#### RECENTLY PATENTED INVENTIONS.

##### Railway Appliances.

**METALLIC TIE.**—Andreas Mattijetz, Giddings, Texas. This tie is made of U-shaped channel iron, with inverted U-shaped cross plates secured by their sides to the sides of the channel iron, flanged lugs secured to the cross plates being adapted to engage the bases of the rails to lock them in position on the cross plate, while flanged vertically extending plates are passed through slots in the ends of the channel iron. The tie is designed to be cheaply manufactured and very durable, preventing the spreading of the rails and displacement of the ties, especially on curves.

**RAILROAD FROG.**—John S. McAdams, Ashland, Pa. A pivoted point is by this invention formed of two rails with an intervening throat piece bolted together and pivoted at the juncture of the switch rails and the rails of the main track, and connected with a pivoted letter, the arrangement being such that a train passing over the frog has a continuous bearing, and jar and noise are avoided. As the wheels have a full bearing, with trains moving in either direction, on the main track or turn-out, the wear and tear are reduced to a minimum.

**ROD STRAIGHTENER.**—Patrick McCann, St. Ignace, Mich. This is an improved clamp for straightening metal rods, bars or braces, and more particularly for straightening sliding switch rail rods or braces on railroads. The improvement consists of a screw clamp with attached turning or pressure foot, which can be readily employed by one man, and without removing the rods or braces from the rails, or necessitating any stoppage of trains.

##### Electrical.

**ELECTRIC GAS LIGHTER.**—Lucien M. Kilburn, Council Bluffs, Ia., and Scott Van Etten, Omaha, Neb. This invention relates to automatic lighting and extinguishing burners in which an oscillating gas valve in the gas tube is opened and closed by armatures and levers operated by magnets, a sparking device igniting the gas when it is turned on. The improved burner is designed to have greater efficiency, capacity, and certainty than has heretofore been afforded by such burners, while obviating all danger of leakage of gas through the valve and burner.

**LIGHTNING ARRESTER.**—William R. Garton, Keokuk, Ia. An armature is arranged to slide in a solenoid having at one end a guide rod which receives a flexible conductor, and at the opposite end a carbon rod, while a pair of serrated plates are arranged with their faces near each other, one of the plates being connected with the ground and the other normally in contact with the carbon carried by the armature. A closed chamber, nearly airtight, incloses the upper surface of the lightning arrester plate and the carbon carried by the armature. This improvement is designed to protect all electrical apparatus connected with the lines, and the dynamo and lamps upon the lines.

##### Mechanical.

**WRENCH.**—Daniel C. Wiest, Mohrsville, Pa. This is a simple, strong, and durable ratchet wrench, readily adjustable to nuts of various sizes, and which can be conveniently operated. It is provided with improved means for changing the ratchet, so that the wrench may be used either as a right or left hand

wrench. It has a revoluble jaw-holding nipple, held to turn in an interior aperture of the wrench head, assisting the action of the jaws.

**BOX MACHINE.**—Charles W. Roberts, Lawrence, Kan. Box blanks may, by the machine provided by this invention, be rapidly and accurately shaped and held in place until they are fastened by nails or otherwise. Upon a suitable support is a stationary form, below which are vertically movable and pivoted jaws and a pivoted bottom plate, in combination with means for simultaneously operating the bottom plate and jaws. The machine is especially adapted to make berry and other light boxes, such as are usually formed of wood veneers, paper board, etc.

**BELT HOLDER.**—William F. Cleveland, Rounthwaite, Canada. This is a simple and readily applied device, more especially designed for use on thrashing machines, etc., where driving belts are exposed to the wind, the device holding the belt in proper place and preventing displacement by the wind. The device rises and falls with the ordinary vibration of the belt, thus lessening the friction, and it also serves as a belt tightener.

**DIFFERENTIAL HOISTING MACHINE.**—Charles F. Cliff, Durham, Canada. In this construction a fixed and a revoluble internal gear wheel are employed, a wheel receiving motion from the fixed wheel and imparting motion to the other wheel, there being two sets of intermediate gearing, with which also the driving shaft is connected. The differential gearing is very simple and compact in construction, and prevents any accidental backward motion of the drum shaft when the drum is heavily loaded.

##### Agricultural.

**CULTIVATOR.**—James Birch, North Ontario, Cal. This is a light and durable cultivator for orchard use, provided with a suitable riding frame for the driver. The cultivator frame can be readily raised or lowered while the machine is moving in a straight line or rounding curves, and the various shovels and scrapers employed can be quickly and easily attached to and detached from the cultivator frame. The riding frame may be detached, if desired, and the machine used as an ordinary cultivator.

**STUMP PULLER.**—Adams G. French, Rapid City, South Dakota. The frame of this device carries an upright shaft, formed with conical large and small cylindrical portions, to which the bore of the main drum is conformed, having at its upper end a tenon-like portion on which is journaled a second drum, above which, on the upright shaft, is journaled a sweep, pins on the sweep being movable into and out of engagement with the main drum or the second drum. In addition to its use in stump pullers, this drum may be used with advantage in derricks and other hoisting machines.

##### Miscellaneous.

**LUMBER DRIER.**—John W. Piver, Americus, Ga. A lumber support is arranged in a drying room of a house warmed by a heater, and is composed of an inclined side support and a base support formed of a series of step-like blocks having their upper surfaces approximately at a right angle to the side support, whereby lumber may be piled in an edgewise inclined position, without the use of racks having