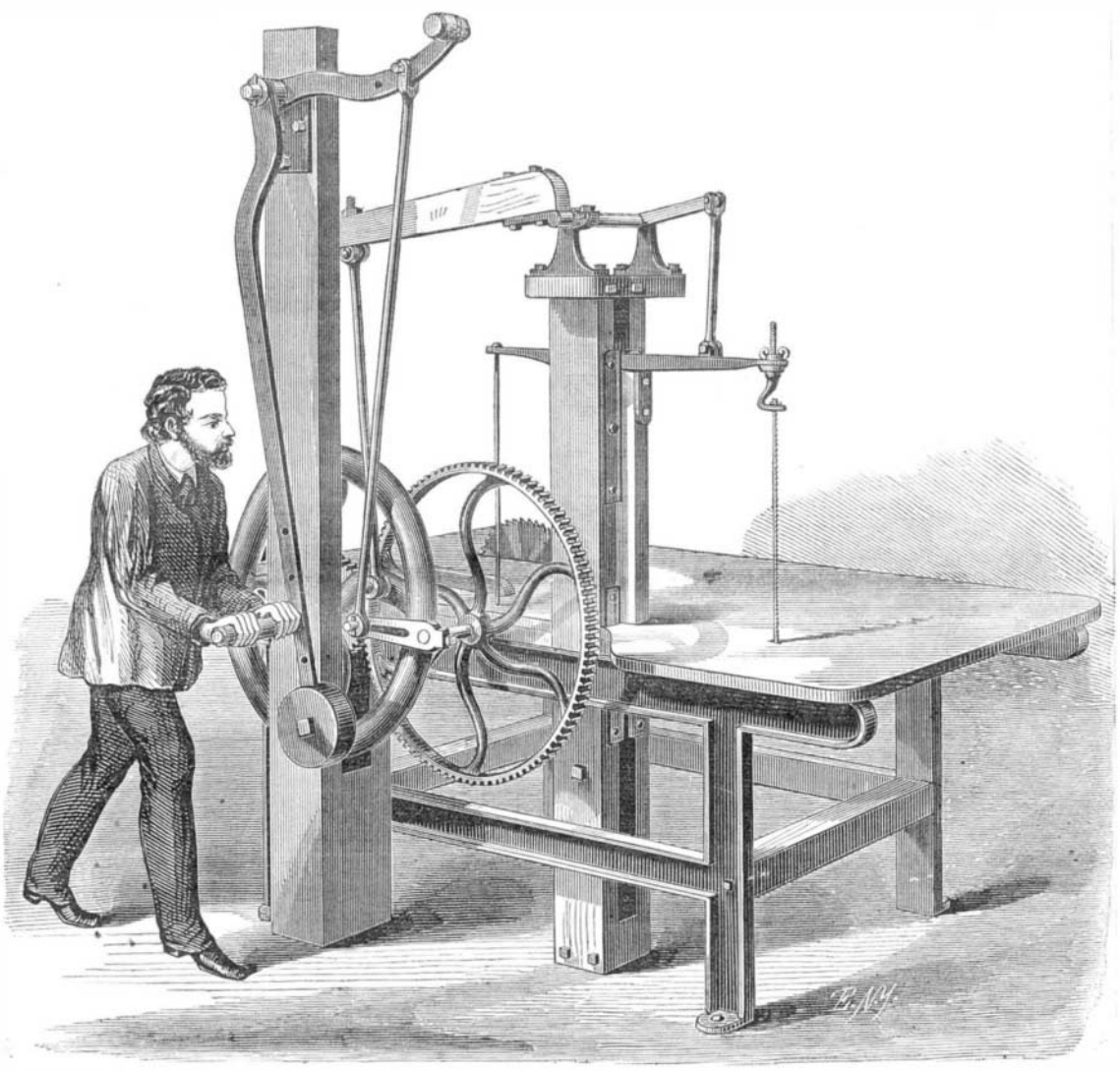
SCIENTIFIC AMERICAN

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES

Vol. XIX.—No. 14. [NEW SERIES.] NEW YORK, SEPTEMBER 30, 1868. $3 per Annum. [IN ADVANCE.]

Improvement in Hand-power Sawing Machines.

In the science and the practice of mechanics there are well-known devices, which are employed as reservoirs of power, sometimes, however, mistaken by embryo mechanics, and by theoretical mechanics and amateurs, as producers rather than storers of power. Such are adjustable and automatically moving weights, the swing of the pendulum, the continued rotation of the balance wheel when once put in motion, and other similar devices. These contrivances for sustaining power have not unfrequently been considered reservoirs or producers of power *per se*, when the fact is well known that one cannot expect from any mechanical combination more ultimate and effective power than that imparted to the prime mover less the friction, etc. Still, there is a "balance of power" to be considered in mechanics as well as in politics, and he who so well divides the prime or first exerted power with the means of utilizing that power to the greatest advantage proves himself truly a mechanic. The machine shown in the accompanying engraving is a beautiful illustration of the adaptation of means to an end. It is a hand-sawing machine carrying a circular and a reciprocating or gig saw, which may both be run at the same time by the power of one man, or even of a boy, or either may be detached while the other is used. The power is applied, as seen, by means of a long pendulum lever swung back and forth, and having attached to its short arm at the top, a pitman connected at its other end with a wrist pin on a balanced gear. This gear meshes with a pinion on the saw arbor, which also carries a balance wheel intended to equalize the motion.



HASSENPFLUG'S HAND CIRCULAR AND RECIPROCATING SAW.

To the upright portion of the frame is pivoted a lever intended to drive the gig saw, the frame of which is similar to those in ordinary use, being two crossheads connected together by rods and braces, and moving in suitable slides in the upright. A bar extends longitudinally with the table from the upper crosshead, carrying at one end the gig saw and at the other a guide, passing through the table and guided by a box under the table bed. The connection between the reciprocating saw and the power is by means of a pitman, one end of which is pivoted to the lever before mentioned, and the other to a crank on the fly wheel.

These are the principal parts of the machine, which is very simple and not liable to become deranged. If only one man operates the machine where little power is required, as in running the gig saw alone, a treadle is attached to the saw frame on the lower crosshead by which the saw can be driven. A treadle can also be connected to the other end for driving the circular saw, its pitman being attached to the crank of the fly wheel. Either of these may be instantly unhooked, when two are at work, one propelling the saws by the pendulum lever, and the other guiding the stuff to be sawed. Or, one may work at the gig saw, and another at the circular saw by means of the treadles, each independent of the other.

The ease of running the machine, and the rapidity of its work are truly surprising. On a trial with a full-sized machine we ran both saws by means of the pendulum, with one hand, while two workmen drove both saws through hard seasoned elm planks four inches thick. We regard it as one of the most useful and valuable machines that have come under our notice. Patented June 11, 1867, by Henry Hassenpflug, assignor to himself and Edward Hassenpflug, Huntington, Pa. The machine is on exhibition at 94 Bowery, New York. Address Hassenpflug Brothers at this No., or at Bradford Place, Roxbury, Mass. See advertisement.

The Hoosac Tunnel.

We copy the following interesting account of a visit to the famous Hoosac Tunnel from the columns of the Hartford (Conn.) *Courant:* —

"The depot of the Troy and Greenfield railroad is three fourths of a mile from the east end of the tunnel. Here new and well finished six-horse coaches take the passengers over the mountain to North Adams, a delightful ride of nine miles, affording extensive and charming prospects. The drivers, coaches, and horses have been brought down from the White Mountain routes, where staging is as near perfect as it can be made, and the ride is as pleasant and romantic as many of the rides in that locality. It is claimed, that even with the nine miles of staging, better time can be made from Boston to the Hudson River than over the heavy grades and windings of the Western Road. Taking into consideration the romance of the mountain ride, the route will very likely become popular as it becomes better known.

"Those who are ambitious to thoroughly inspect the work at the tunnel, should stop over a day, and enter it at the eastern portal, first taking a look through the machine shops. On the east side, the mountain has been penetrated nearly one mile, though the enlargement of the tunnel to the full size necessary for the passage of trains is less than one half that distance. If one undertakes to walk into the mountain to the heading, he will have an ardent admiration of the perseverance and pluck necessary to accomplish the work which has already been done, before he has accomplished half the journey; but he will find no variety in the scenery to charm him. Solid rock was struck at the east side almost at the first blow, and the penetration of one mile has been through the toughest granite. The central shaft, from the top of the mountain, half way over, was sunk to a depth of 583 feet, when the terrible accident, last year, buried fourteen workmen in the shaft, and the deep cavern being filled with falling timbers and water, work was suspended. Machinery is now being put up to clear the shaft, when the work of sinking it to the tunnel level will be proceeded with. This shaft is elliptical, 27 by 15 feet in size, and is to be sunk to a depth of 1030 feet, when work upon the tunnel each way can be prosecuted from this point.

"The west shaft is the most interesting point to visit. From the west portal, a distance of about 700 feet has been completed, through quicksands, and 'demoralized rock,' and mountain springs, and the tunnel is of the required size, 24 feet wide and 10 feet high, large enough for a double track, and is arched with brick. At the west shaft, a half mile east of the portal, your correspondent found a collection of buildings containing engines, pumps, machinery; and everything in the surroundings showed the systematic progress of a great work. Entering one of the buildings, we looked down the shaft. Out of it came rushing a volume of steam, so that the eye could not penetrate through the misty atmosphere more than ten or fifteen feet. Up and down in this shaft go the laborers, hoisted or let down by alternate buckets or dummies, which also bring up the stone which is loosened by the glycerin blasts.

"It required some nerve to visit the depths below, the entrance to which looked like the opening of the doors of Hades, and as the thick steam rolled out, it was easy to imagine that it smelled of brimstone. Accepting the offer of rubber clothing, from hat to boots, and supplied with a well-trimmed lamp, your correspondent and an adventurous traveling companion prepared to descend. We called to mind the fact that men were constantly going into the depths, and returning safely, and putting confidence in a wire rope an inch in diameter, we jumped into the dripping, dirty, car, the signal was struck, and down, down, into the steaming dark abyss we were speedily plunged. The sensation, as one goes down, shut out from the light of the sun, and hearing the dull, heavy thud of the mammoth pumps, which throw out the accumulating water, is hard to describe. The mighty pulse of the mountain seems to be throbbing, and one listens, as if expecting some grand upheaving to punish man for his temerity in attempting to invade the realm of the inhabitants of the lower depths. Soon we touch bottom, and, alighting, trust to our feeble lights to explore the terrible darkness. Fifteen hundred feet away, into the bowels of the mountain, men are working with sledge and drill, each with a light; but we see them not through the inky darkness, and the sound of their steady strokes falls dead against the rocky ribs of the cavern long before it reaches us. We find ourselves surrounded by no fairy forms, and in no beautiful grotto, like the pictures in fairy tales; but in a rock-ribbed and arched cavern, where no sound of ordinary life reaches us. The air is fresh and good, being forced down from above through long pipes by powerful compressors, and the temperature is as grateful to the person on a hot August day as that of a refrigerator to a piece of melting butter. The exhibition of man's patient, persistent work, delving through fifteen hundred feet of rock to the eastward and over one thousand to the westward, excites one to poetical thoughts. But our poem on 'Pluck,' inspired in the cavernous depths, but never committed to paper, we wont ask you to print. We only advise a visit to the spot, where the working of the pneumatic drills into the rocky face, the patient blows of the sturdy miners, the systematic toil toward the accomplishment of this great enterprise, will excite thoughts which it is well worth a short exile from sunlight to experience. At all the working faces the toil goes on without cessation, night or day, except Sundays; and then the engineers take possession of the tunnel to accurately observe the progress and pursue the calculations which are, with unerring certainty, to bring the working forces together midway under the mountain. There are three gangs at each face, who work eight hours each; and it is calculated to put in and explode a glycerin blast during each eight hours, the drills penetrating the rock about three feet at each drilling. The workmen are Irish, French, and English; and their wages are $1 75 per day for ordinary laborers, and $2 25 for miners. Those who work regularly their eight hours daily in the tunnel are strong and healthy, but those who are in and out frequently, from the sun's heat to the earth's cold dampness, and *vice versa*, often suffer from rheumatism.

"From each end the tunnel is worked on an up grade of 26 feet to the mile, the grade to be continued to the point of meeting at the central shaft. When completed it is calculated that this shaft, 27 by 15 feet, will comprise a monster chimney, which will keep the air of the tunnel pure, and clear it quickly of the smoke of passing engines.

"Under the track is to be a central drain to draw off the accumulating water. Already a stream runs from the west-

ern portal sufficient to make a good mill privilege. Some Yankee will utilize this power, no doubt, when the work is completed.

"Altogether, the mountain has been penetrated, at all the workings, about one and three fourths miles. The entire length of the tunnel being four and three fourths, there are yet three miles to penetrate. It will be too bad if the work is ever given up after so much has been accomplished. The trouble now seems to be in satisfactorily adjusting the contracts for completing the work with the $5,000,000 appropriation. The friends of the project very sensibly desire to divide the work into small contracts, and the Commissioners have advertised for proposals under this plan The opponents of the tunnel argue for one contractor, believing, no doubt, that no one man can be found who will take so large a risk, and be able to give satisfactory security for the completion of the work. They hope the $5,000,000 appropriation will fall by its own weight. But Massachusetts cannot afford to turn back from this great enterprise."

THE ORIGIN OF PETROLEUM.

Denton, in his popular lectures on Geology, entitled, "Our Planet, its Past and Future," after making some remarks upon ancient sources of rock-oil, etc., thus speaks of the original causes of these deposits:

"This is, then, no new thing; but whence comes it? And in answer to this question we have many theories, some of them sufficiently ludicrous. One suggests that, since the earth is a huge animal, the rocks its bones, the water circulation in them its blood, the grass and trees its hair, the hills pimples upon its face, and Ætna and Vesuvius eruptive boils, all that is necessary to obtain oil is to bore through the skin into the blubber of the monster, and oil very naturally flows from it. Another supposes, that, during the time of the flood, the great whales were buried deep under accumulations of mud, in those places where the oil most abounds; and hence petroleum is merely antediluvian whale oil. It has been suggested, that, since the earth is at some period to be destroyed by fire, the oil was probably prepared against that terrible day when the match will be applied, and the world burned up.

"Apart from these ludicrous explanations, however, men of science have considered this question, and rendered their verdict. Professor Silliman says that 'petroleum is uniformly regarded as a product of vegetable decomposition.' Professor Dana says, 'Petroleum is a bituminous liquid resulting from the decomposition of marine or land plants (mainly the latter), and perhaps, also, of some non-nitrogenous animal tissues' By many, it is supposed to be a product of coal; and hence the name of 'coal oil,' so frequently applied to it. Some suppose that the coal, being subjected to the enormous pressure of the overlying beds, has yielded oil, as a linseed-cake does under an hydraulic press; and I have seen the theory advanced, that the coal, heated (as it evidently has been in the coal regions of Eastern Pennsylvania), gave off oily vapors which, rising to the cold region of the upper air, condensed, and subsequently fell in oily showers, making its way as best it could to the hollows of the earth's interior, where the oil-borer finds it to-day.

"Facts play sad havoc with these various theories. If the oil comes from coal, it seems strange that it is so rarely met with in a coal district. I have visited coal mines in England, Wales, Nova Scotia, Cape Breton, and not less than ten of the United States, but never saw petroleum in a coal mine, or even smelt it; and this is an article that never waits for an introduction, but salutes the olfactories at once. Of course, if this came from coal, coal mines would be the places in which to discover it; coal neighborhoods should abound with it, coal miners be familiar with it; and it should never be found in rocks older than the coal measures. The contrary of all this is true. When it is found in the coal measures, it has been forced up from underlying beds in which it was originally contained.

"In this country, nearly all the oil hitherto obtained has been from beds that lie below the coal measures, and sometimes at a great depth below them. On Oil Creek, in Pennsylvania, it is found by boring in shales and sandstones, sometimes to a depth of a thousand feet; these beds belonging to the Chemung group of the Devonian formation, and many hundred feet below the coal measures. At Enniskillen, in Canada West, where the oil has at one time come up in springs, and overflowed, leaving a thick bed of asphaltum covering the ground for an acre, the limestone in which borings are made contains characteristic fossils of the Hamilton group of the Devonian formation. The oil wells in Western Kentucky, and in some parts of Tennessee, are in the Trenton limestone,—that is, in the lower Silurian formation; and I have seen oil even at the base of this. The same oil floats on the surface of a limestone quarry near Chicago, the limestone belonging to the Niagara group of the Silurian formation; showing conclusively that it has no necessary connection with coal.

"But may it not have been produced from sea plants, as coal has been from land plants, as several eminent geologists have supposed? The quantity of free oil existing in the earth seems to forbid this. I saw a well in Western Virginia which produced twenty-eight thousand barrels in ten months. From three wells near Oil Creek, one thousand barrels spouted in twenty-four hours; and from one, three thousand seven hundred and forty. The 'Big Phillips' Well struck oil in October, 1861, at a depth of four hundred and eighty feet. It yielded about three thousand barrels a day. The oil rushed out with such violence, that the well could not be tubed for several days; and it has been calculated that forty thousand barrels of oil were lost in the creek before it could be collected.

"The 'Noble' Well struck oil in April, 1863. Its daily yield was about fifteen hundred barrels, at which rate it flowed for six months.

"There must be lakes of petroleum to render such flows possible. Where are the bodies of fucoids or sea weeds from which this oil could flow? The sea weeds of the Silurian and Devonian times (in whose beds the greatest quantity of petroleum is found) were so loose in structure, and contained so little bituminous matter, that their impressions do not even darken the light colored shales in which they are found embedded. Had these plants been as oily as fish, their bodies would have left dark impressions on the shales, as the bodies of fish do; and if they were not as oily as fish, or as bituminous as land plants, by what possibility could they produce lakes of oil? If the plants had, indeed, been oily, no oil could have been collected from them, unless preserved from contact with the air and water. Each plant being separated from its companions, on being buried in mud, the oil, supposing any to exist, would have been absorbed by it, and thus lost.

"Has the oil been distilled from bituminous shales, as some suppose? I think not. It requires a strong heat to distil oil from shales; and generally, where petroleum is found in the greatest abundance, there is the least appearance of igneous action.

"How was it produced, then? It is a *coral* oil, and not a *coal* oil. I have in my possession numerous specimens of fossil coral, obtained from Devonian and Silurian rocks belonging to the family of *favosites*, or honeycomb stone, as the name means the cells of which very much resemble those of the honeycomb; and, as the cells of the honeycomb are filled with honey, these cells are filled with oil. I have found oil in some specimens nearly as limpid as water; and, by heating the coral, oil runs out readily. I have seen these oil-bearing corals at Smokes Creek, where there are coral reefs full of it; in the Silurian limestones of Middle Tennessee; at Williamsville, near Buffalo; and in rocks near Penn Yan, in New York. In the State Collection of Fossils at Albany, and in the Montreal Geological Cabinet, there are numerous specimens. Professor Dana informs us, that it flows in drops from a fossil coral at Montmorenci, Can., and at Watertown, N. Y. It might be supposed that this oil filled the cavities of the corals, as it might any other cavity in the rocks; but I have found it repeatedly in these corals, and in no other part of the rock, invariably accompanying the corals, and never connected with any other fossil; these corals frequently in the center of solid limestone blocks. Reefs of such coral would furnish oil in quantities sufficient to account for the immense deposits that have been discovered. Preserved by them in compact bodies, the oil taking up at least half the space of the coral reef, we can readily suppose, that when the cells were crushed by the superincumbent weight of rock, or during uphevals and subsidences, cavities and crevices in the earth's interior would be filled by it.

"It is, then, an animal production, and not a vegetable one It is a product of the ocean, and not of the land; being almost invariably associated with salt water from the bottoms of seas that then covered a large portion of Western New York, Pennsylvania, Virginia, Eastern Ohio, Kentucky, and Tennessee. It is not formed from the bodies of the coral polyps, as some have supposed,—for, when dry, they are a mere film, that could be blown away by a child's breath,—but secreted from the impure waters, principally, though not exclusively, of the Devonian times; the coral polyps performing the same office for the water that the carboniferous plants did for the air."

ELECTRICAL NOVELTIES.

Electricity is a wizard's power. With it and little mechanical skill a man may turn his house into a magician's castle. The late ingenious Mr. Appold—of centrifugal pump notoriety—indeed, did this without it; his room doors opened as you approached them, and shut behind you; his stable gates did the same; upon touching a spring, the window shutters closed, and the gas was turned on; his apartments maintained themselves at a uniform temperature, and at a proper hygrometric state, by regulating thermometric and atmospheric damping apparatus; in short, his house was full or surprising devices, created and worked out by his wonderful inventive and executive skill. Had he pressed the subtle fluid into his service, there is no saying into what a palace of enchantment his dwelling would have been transformed But what he did not do has been done by the famous Robert Houdin, who has made electricity do the work of a retinue of servants and a watchman to boot, a full description of which will be found on page 178, Vol., XVIII SCIENTIFIC AMERICAN.

Such are a few of the domestic functions of the most ubiquitous slave that science has entrapped for man. Of its public services we need hardly speak; telegraphs have become too familiar to be longer regarded as curiosities, even those that send the message in fac simile of the hand in which it is written, or reproduce a drawing a hundred miles away. Electric lights, too, have ceased to be surprising, though they are far from having been used to their full powers. There have been difficulties in the way of getting a good and cheap source of electricity, which have barred the way to their extensive introduction; but some of these are removed and we may entertain better hopes for the future. One of the great doctrines, perhaps the greatest, of the present era of science, is that of the convertibility of forces one into another. Heat is turned into mechanical force, and mechanical force is turned into electricity, and *vice versa*; and heat and electricity are similarly interconverted. A celebrated London photographer has erected a magneto-electric machine for conducting some of his operations which require an intensely bright illumination, and has thus apparently become independent of the sun; in reality, he is using the solar rays which came to our planet thousands of years ago, for what is coal but "bottled sunshine?" A Birmingham electro-plating firm also set up a similar machine for depositing their precious metals, and a sugar refinery another for generating ozone to bleach sugar. But the principal use of such an apparatus is for lighthouse illumination. A French company bought the patent for France to this end, and the light was to be tried at Cape Grisnez. It was not only to illuminate the Channel "a giorno," but to shed a mild twilight over our own southern counties. We have not heard of the trial—perhaps it has yet to come off.

From lighthouses, the transition to buoys and beacons is easy. These an ingenious inventor has proposed to illuminate by electricity. Those who attend scientific lectures, or look into instrument-makers' shops, will have come to know something of coils called "induction coils," for producing in effect a very powerful current of electricity from a very weak one, and of certain glass tubes and globes for exhibiting the passage of the electric spark through a partial vacuum. Well, the inventor aforesaid proposes to place a battery and a coil in the hollow body of a buoy, and to lead the current to one or more of these vacuum tubes inclosed in a lantern on the top. A steady light, glimmering like a glow-worm on the sea, would thus be secured, and neither wind nor wave could readily extinguish it. Some one else invented a lamp for miners on the same principle: a knapsack was to hold the battery and coil, and wires were to lead to a lamp composed of a vacuum tube carried in the hand. There could be no doubt of the safety of this light—in this respect it would rival the immortal Davy's invention; but portability is a rather necessary feature in any tool a pitman has to use, and the knapsack and entangling wires might prove rather worse than an inconvenience to him, especially when, as happens occasionally, he has to pick and wriggle his way, worm fashion, through a one foot seam.

Perhaps, after all, the most curious application of the electric light was that attempted lately at one of the Paris theaters. The actors were decked with glittering crowns, and, to add to their brilliancy, they were so made that a chaplet of electric sparks encircled the wearer's head; the necessary current being supplied and led to the coronet from a concealed battery. But the "sensation," pleasing enough doubtless to spectators, painfully verified the truth of the Shakespearian maxim touching the uneasiness of the head that wears a crown, for one of the performers was grievously injured by the passage of the current through his or her head, instead of through the star-spangled ornament Not quite so striking, but still curious, are the electrical jewels made by MM. Trouvé and Cadet-Picard. These consist chiefly of scarf pins and brooches, representing heads of men and animals, which roll their eyes and work their jaws. Some are in the shape of tiny soldiers which beat drums, rabbits that play on tambors, and birds that flap their wings and fan their tails. They are worked by tiny electro-magnets concealed within them, and connected by fine wires with little batteries carried in the pocket or elsewhere about the dress. Fashionable Paris was charmed with these trifles for a season; doubtless they are forgotten by this time. Electricity is an agent peculiarly suited to French ideas, and has been turned to more droll uses by that people than by all the rest of the nations of the world put together. When rifles were the talk of the governments of Europe a few months ago, the emperor was shown one to be fired by electricity; the stock of the gun enclosed a battery, from whence wires passed to the breech and into connection with a platinum wire passing through the cartridge. The pull of the trigger closed the electric circuit, and in an instant the platinum wire became red hot and ignited the powder. The cartridge carried no fulminate, so it was a very safe one. The emperor, it was said, greatly admired the gun; he preferred to adopt the Chassepot, however.

From killing to curing. While one man is using his ingenuity to throw bullets into his fellow man, another is devising schemes to take them out. Probing the body for these missiles is a tedious and painful operation, and its difficulty chiefly lies in discovering the bullet amongst the fragments of shattered bone by which it may be surrounded.

Electricity affords the means of doing this. The probe is made with two points, from each of which a wire passes; and in the circuit is placed a battery and a signal bell. So long as the two points are not metallically connected, no current passes and the bell is silent; but, when they are joined by any piece of metal, it rings. When, then, the surgeon thrusts the probe against bone or muscle, there is no effect, but when the points come against the metal bullet, the bell announces the fact: the forceps for extracting the lead behave in the same manner. That electricity exercises an exciting influence over sluggish nerves is a fact insisted upon by medical galvanists, but it likewise appears to possess a deadening power over such as are excited, for a dentist in Bordeaux has applied it to dull the pain of tooth extraction. Report has spoken well of the application, but details of the *modus operandi* are wanting. For this one painful operation, at all events, chloroform has possibly been superseded by electricity; but the latter has joined issue with the former in another way, for two French electricians have very recently announced, as the result of experiments tried upon animals, that a powerful shock or strong galvanic current will restore animation in cases of over-stupefaction by the sedative.

These actions are inscrutable enough, but some recently announced influences of the fluid upon vegetable organisms are more puzzling still. In the beginning of the century a learned Abbé wrote a treatise on the applicability of atmos-