Scientific American.

NEW YORK, APRIL 11, 1857.

Lead, Lead Pipe and Shot.

We have just spent an hour in the manufactory of T. O. LeRoy & Co., in Water street, the concern before referred to as manufacturing drop shot, without a tower, under the patent of David Smith, one of the partners. The depth to which the shot are allowed to fall is forty-five feet, while the familiar shot tower up town, on the bank of the East river, allows the shot to drop 160 feet, the Centre street tower about the same hight, and the new one on Beekman street 200 feet. This latter is sufficiently high to manufacture, by the old processes, any sizes ever attempted by dropping; but the same sizes are also manufactured on the Smith principle by only dropping 48 feet, and as the best criterion accessible to us by which to most accurately judge of their merits, we may observe that the shot by each method of manufacture sells at precisely the same prices, and the manufacturers of both methods seem to be very busy. In the LeRoy establishment no special erection was necessary, but the shot are simply dropped through hatchways in the building. A series of pans of sheet iron, each some two feet in diameter, being prepared, the bottoms are punched full of holes of a given size and either is used according to the size of shot required. A pan is placed over the hatchway, and a man continually dips lead from a large kettle by his side, and pours it into the pan, occasionally stirring the bottom. The metal drops, in a silvery shower, some thirty feet in full view, and then enters the top of what resembles a steamer's smokepipe, the lower part of which stands in water. A powerful blower is connected with this large pipe, and forces up a current of cold air, more or less strong in proportion to the size of shot being manufactured; and elevators just outside, similar to those in a common flouring mill, are continually dragging up the wet shot, and pouring them on a steam heated platform to be dried, after which process they are sifted, to assort the sizes, and polished by friction with black lead in a machine for the purpose.

Drop shot are rounded by the mutual attraction of their particles. A drop either of water or lead voluntarily assumes the form of a perfect sphere, if unaffected by any external circumstances. If such a globule of lead can be left free until it cools, a perfect shot is produced, but in practice several difficulties are encountered. Shot require about three and a half seconds to fall 150 feet, and the rapid motion through the air cools them so much that a violent plunge into water at the end of that period does not indent them. It is necessary, however, in manufacturing shot of any considerable size by simple dropping to adjust the temperature of the lead very accurately. If too cold it chills on the pan as the drops are gathering beneath the holes, and if too hot the rapid motion through the air induces what are called "explosions" in many of the globules, and the shot assume every conceivable form except the one desired. Smith's process probably produces its effect partly by throwing up more particles, and that of colder air, into contact with the lead, and partly by suspending, or rather retarding, the fall of the lead. We had supposed that this latter effect was obvious, but it is not. The current of air employed to-day in the manufacture of small shot was, as far as could be judged by the effect on the hand, almost too insignificant to hold up cork.

Lead of commerce, unlike some metals, is almost chemically pure. Shot manufacturers put with each ton about half a pound of arsenic, the effect of which is to render the metal more fluid or more inclined to assume a perfectly spherical form in dropping. A large number of shot, however, in every kind of manufactory, prove imperfect, and are separated from the rest by rolling down a very moderately inclined plane of smooth iron. The round shot move gradually down without any difficulty, while the imperfect ones stop, and are brushed off.

Buck shot are moulded in short molds, a score or two at a time. The molds are so constructed that there is absolutely no neck on the shot, but when the lead is shaved off the top—which is done in about three or four seconds after its pouring—each shot is left with only a flattened side where the chisel has cut across.

Some eight or ten small machines are constantly employed in this manufactory, making compressed shot and balls. A flat bar of lead is fed in on one side of the machine, and is cut off into chunks resembling a brick. These are caught endwise between dies, and compressed into perfect spheres, the middle bulging out as the corners are forced in, so that the effect is a smooth, dense, and round ball. Buck shot or rifle balls—for they may be used indiscriminately—were being manufactured to-day by these machines, size OO, or eighty to a pound.

The same machines have been employed with success in making perfect pointed or Minie rifle balls of any required form, and when fitted with the proper size of lead makes them at the same rate—90 per minute—but the demand for such balls is very moderate in any country in time of peace.

Lead pipe is forced out cold, or rather at almost a melting heat, through a round orifice, in which a circular mandrel is placed. A hollow cylinder some eight inches in diameter, and two feet deep, is mounted on the plunger of a hydraulic press, and fitted with a bar of perfectly round and smooth cast steel rising from the center. This cavity is filled with melted lead, and, after waiting till it chills, the small powerful force pumps are set in motion, and the whole gradually rises into contact with a plunger fixed above. This plunger is also steel, and has a hole through its center, something larger than the smooth round bar referred to, and the pressure induced by the pumps on the plunger compels the lead to rise in the form of a pipe, and protrude itself from the top, where it is seized and coiled around a wheel. The pressure per square inch on the lead necessary to effect this operation is greater in proportion as the pipe to be manufactured is small and thin. The force of 150 tons is the maximum or greatest employed in this process, and is, as may be readily calculated, equal to about three tons per square inch on the lead, while the area of the water cylinder being about 132 square inches is subject to a pressure of a little over one ton per square inch. The water for the purpose is forced in by three single-acting plunger pumps, the cast steel and strongly guided plungers of which are each 1 3-4 inches in diameter, with a stroke of five inches. We give these as they may aid others in designing such hydraulic presses for great strains; but these though in constant use with perfect success, and therefore tolerably safe examples for imitation, are by no means the most powerful in use. The pumps employed in forcing to raise the tubes of the Britannia Bridge, in Wales, were 1 1-16 inches in diameter, with a stroke of sixteen inches, and produced a pressure of three tons per square inch on the water.

The wholesale prices of the materials under notice are at present about as follows:—Pig lead, 6 1-2 cents per lb.; bar lead, 7 cents; Pipe, 8 cents; Drop shot, 7 1-2 cents; molded shot or balls, 7 3-4 cents; compressed balls, 8 cents.

It would be interesting to know how great an increase of density is produced in lead or other metals by subjecting it to a given amount of compressive strain, but we are not aware that any experiments have been made on the subject.

Etching Marble.

Trace figures on marble and then cover them with a varnish composed of sealing wax dissolved in alcohol, and allow them to dry. Now, pour over the surface of the marble, some dilute muriatic acid; it will bite or eat down the marble in the spaces not covered with the wax-varnish, which will remain in relief. The acid must be washed off when it ceases to effervesce, and before the varnish is removed.

Mind and Matter.

The re-publication, by G. P. Putnam & Co., this city, of Sir Benjamin Brodie's recent remarkable work on "Mind and Matter" is a valuable addition to our scientific literature. What can be more interesting to man than the study of himself? To-day we find him a helpless infant; in a few years more, a thoughtless boy, chasing the butterfly as joyous and free as the "wandering winds;" then he becomes a man, and builds houses, ships, machines, towers, palaces, and cities; leads armies to battle, and extorts the applause of senates by his eloquence; then he drops into the grave, and soon becomes a few handsfull of dust. Is this being who leaves behind him such records of his existence and power—records that endure for thousands of years after he is dead—nothing more than dust and ashes—a mere piece of matter, like a stock or stone? In answer to such a question as this, Sir Benjamin Brodie says:—

"The properties of mind are wholly different from those of matter; the two are so completely asunder that they do not admit even of the most distant comparison with each other. I can easily imagine that motion, gravitation, heat, light, electricity, magnetism, and chemical attraction have something in common; that they are so far of the same essence as to be convertible into each other; but it is to me wholly inconceivable that any exaltation of the known properties of matter should produce the conscious indivisible *monad* which I feel myself to be."

The nervous system is composed of two substances of different organization; the one, called the *medullary*, is of a white color, soft consistency, and composed of fibres; the other is cellular in structure, of a still softer consistency, more largely supplied with blood vessels, gray in color, and not fibrous. This gray matter is smaller in quantity than the medullary, and is disposed in layers, in which the fibres of the latter seem to have their origin. Sir Benjamin says:—

"It is generally supposed that the function of the medullary substance is to conduct, direct, and make use of the nervous force, the latter being generated in the gray substance, and, in itself, always one and the same, though converted to different purposes in different parts, much as the electricity generated in a voltaic battery is made by means of one apparatus to produce chemical decomposition, and by means of others to direct the needles of the telegraph, or convert common iron into a magnet.

We may carry the parallel between the nervous and the electric force further still. Although the gray matter of the nervous system is necessary for the production of the former, it is not, in itself, sufficient, any more than the alternate plates of zinc and copper are sufficient for the production of electricity.

The acid solution added to the voltaic battery is required in one case; the presence of blood which has obtained a scarlet color, and undergone other changes by exposure to the air in the lungs, is necessary in the other."

This comparison of the brain to an electric battery is nearly similar to that of Napoleon the Great. Just after Volta (in 1800) had discovered the *pile* which bears his name, Napoleon sent to Italy and invited him to visit Paris and exhibit his experiments before the *savans* of that city, that they might hear from his own lips the mode in which he had pursued the subject. Volta came, and spent three or four days in lecturing to the French Institute upon the details of the subject. The effect produced upon dead bodies by galvanic action—now so well known—was there exhibited, and excited universal astonishment. Napoleon, while witnessing these experiments, turned to Corvisart, his physician, and mentioned the striking analogy between the phenomena of galvanism and those of life, and went on to show how the vertebral column (spinal marrow) might act as a voltaic pile.

In 1830, Sir John Herschel made an observation in his preliminary "Discourse on Philosophy" bearing a striking analogy to that of Napoleon, without any knowledge of the above anecdote. He says:—"If the brain be an electric pile constantly in action, it may be conceived to discharge itself at regular intervals along the nerves which communicate with the heart, and thus to excite the pulsation of the organ." Dr. Arnott published a work on physics, quite a number of years since, in which precisely the same idea is suggested.

Sir Benjamin Brodie is very distinct and clear in reference to the action of scarlet blood on the brain as the exciting liquid of the nervous system. "If dark colored or venous blood," he says, "be substituted for arterial blood, and transmitted to the brain by the arteries, insensibility is produced in the individual. It acts as a narcotic poison." Strangulation, drowning, and fits of apoplexy produce these results. The total suspension of the supply of arterial blood to the brain for a very few minutes is sufficient to produce death. The infamous system of garrotting, or strangulation, which has of late become notorious in New York and other places in connection with robbery, is as dangerous as it is wicked; and its perpetrators, in every case, should be assigned a place with murderers.

The necessity of breathing pure air, in connection with a healthy condition and proper action of the lungs, is, therefore, apparent, in order to supply the brain with red blood. Various substances taken into the lungs in the state of gas, or into the stomach in the form of liquids or solids—when taken in excess—produce the same effect upon the brain as venous or dark colored blood. By inhaling chloroform, ether, or nitrous oxyd gas, according to the quantity partaken of, the mind will be subject to peculiar hallucinations, or will become utterly unconscious. Alcoholic drinks stimulate the nervous system, and excite to mischievous actions. The effect of narcotics, such as opium, when taken into the stomach, is to soothe the nervous system. Sir Benjamin Brodie considers that the use of opium is less dangerous to individuals and society than gin. "Desperate characters," he states, "prepare themselves for criminal undertakings by libations of ardent spirits; never by opium. It is worthy of notice that opium is physically much less deleterious to the individual than gin or brandy. Many opium-takers live to a great age, while dram-drinking induces disease of the liver, with its attendant bodily suffering, ill temper, wretchedness, and premature death." These opinions are contrary to those entertained by the public generally.

The effect of opium on the mind is to fill it with the most gorgeous images. The world is shut out to the opium-eating Turk, but he sees in the imagery of his brain, cities, temples, genii, and fairy lands.

The Hindoo uses an intoxicating drug called "hachish" (an extract of Indian hemp) to produce sensations as peculiar, though altogether different, from those of opium. He becomes intoxicated, but not with things of the imagination. Minutes seem to him like hours, and hours like years; whispers sound like rolling thunder, sparkling waters assume the most gorgeous colors, green, purple, blue, and gold. It is remarkable that a number of persons who have been rendered *insensible*—a common, but loose term—by drowning, relate their experience of sensations very similar to those produced by the hachish.

India Rubber Patent Cases.

On the 31 inst., at Providence, R. I., Judge Pittman, U. S. Circuit Court, granted an injunction against Messrs. Bowen, Brown & Chaffee, preventing them from manufacturing india rubber boots and shoes. The injunction was applied for in the name of Chas. Goodyear and other associates.

On the same date, in the U. S. Circuit Court, this city, Judge Ingersoll presiding, an injunction was granted against the Union India Rubber Co. in favor of the New England Car Spring Co., to prevent the defendants from manufacturing india rubber car springs.—These two cases related to terms of sale and assignment, not infringement of patent.

India rubber is a tough subject—now one party victorious, and now another, before the courts. The lawyers understand how to bring out all the grand elastic and never-ending law qualities of this material.