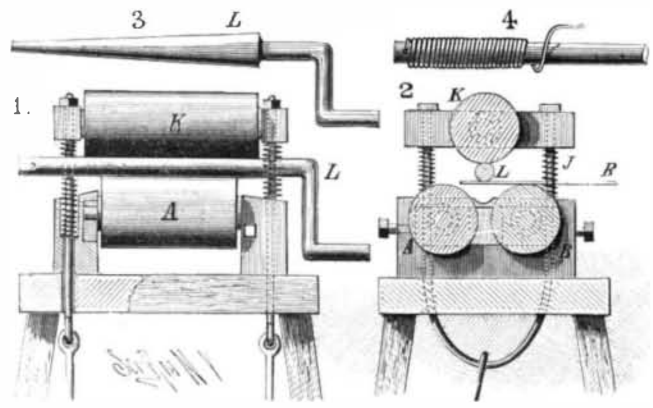
TINSMITH'S ROLLER.

The two lower rollers are journaled in boxes held adjustably in blocks on a platform supported by legs. A U-shaped frame passes up through each block and the platform and through blocks held above the rollers, and upon the upper ends of the prongs nuts are screwed. A roller, K, is journaled in the upper blocks, which are pressed upward by springs coiled around the prongs. Held loosely between the rollers is a mandrel, L, made either tapering or of a uniform thickness, and provided at one end with a crank handle. When the mandrel is pressed down, it enters notches formed in the center of the lower blocks. The bent frames are joined to levers, forming a treadle by which the roller, K, can be brought down.

The piece of sheet metal, B, to form the tube is placed on



BEALS' TINSMITH'S ROLLER.

the front roller, and the mandrel is inserted between the metal and the upper roller, when the treadle is depressed. This movement presses the mandrel down between the rollers, bending the metal. By turning the mandrel the rollers will be revolved and the piece of metal will be fed into the machine, and in its passage will be rolled around the mandrel. Tubes of different sizes are formed by using mandrels of greater or less diameter, and adjusting the rollers, A B, to or from each other as the case may be. When the tapered mandrel is used, the rollers are inclined to each other by means of the set screws. When spring wire is to be made, one end of the wire is passed through the hole in the mandrel (Fig. 4) and the wire wound on by turning the mandrel. This invention—recently patented by Mr. L. F. Beals, of Marquette, Michigan—can be applied to the ordinary tinsmith's rollers.

Glucosed Leather.

The fact that glucose is extensively employed in the adulteration of sugar, candy, and sirups has been well known for some time; we have even been told that the bee has been cheated out of the products of its honest labor, by substituting glucose for honey in the markets. While we fully admit that the number of applications of glucose in the adulteration line is almost unlimited, we are rather surprised to hear that tanners have used it to give additional weight to their leather. According to a circular recently received by the *American Tanner*, Louisville appears to be the headquarters for such fraudulent practice, and in order to save the reputation of the oak-tanned leather of that city a number of tanners sent out a challenge to find such adulterations in any of their products; by thus publicly denouncing any departure from ancient honest methods, under their full names, these firms hope to open the eyes of purchasers as to those who dare not join the protest, and are unable to sell their leather under a guarantee that it has not had its weight increased by any fraudulent means. The names of the firms who have signed the circular are as follows: Wedekind, Hallenberg & Co.; Louisville Leather Company; D. Frantz & Sons; Phœnix Tanning Company; Mantle & Cowan.

Speaking about the above subject, the *Shoe and Leather Reporter* says: "An effort is being made by the manufacturers of grape sugar to induce tanners to make use of this substance as a means of giving additional weight to leather, and it is even claimed that some tanners have been foolish enough to yield to such temptations. Glucose is a fraud, however used. It is even a greater fraud when used on leather than when used in adulterating sirup or sugar."

When we are told that some samples of leather have been found which had as much as 30 to 40 per cent of extra weight, it seems that something should be done in this matter. There are numerous tests for glucose, but the most of them require a number of more or less expensive apparatus, while the following recommends itself by its simplicity and cheapness, as the complete outfit, consisting of a small test tube and two small bottles, one containing cupric sulphate and the other caustic potash, may be obtained anywhere, and can be carried with ease in a vest pocket.

A little scrap of the suspected leather is soaked in pure water; to this liquid, enough to fill about one-quarter of the test tube, we add a few drops of a solution of cupric sulphate and half as much of a caustic potash solution as the liquid contained in the test tube; shake well and boil over a flame. If glucose is present, a yellow or red precipitate is formed in the tube.

Cupric sulphate, or blue vitriol, readily dissolves in water, and enough of it must be added to the sample to produce a faint blue coloring. The caustic potash solution is made by dissolving 58 grammes of the potash in 1 liter of water.

The principle upon which the test is based is as follows: The boiling alkali converts the glucose into glucic and melassic acids, substances which oxidize rapidly. The cupric sulphate is then converted into cuprous sulphate, and this again is decomposed, forming a deposit of cuprous oxide. Of course it is only a rough test, because we are told that under normal conditions leather contains a trace of glucose; but if the test has been performed once or twice on good leather, any excess of glucose in other samples can easily be detected by the deeper color of the more copious deposit in the test tube.—*American Tanner*.

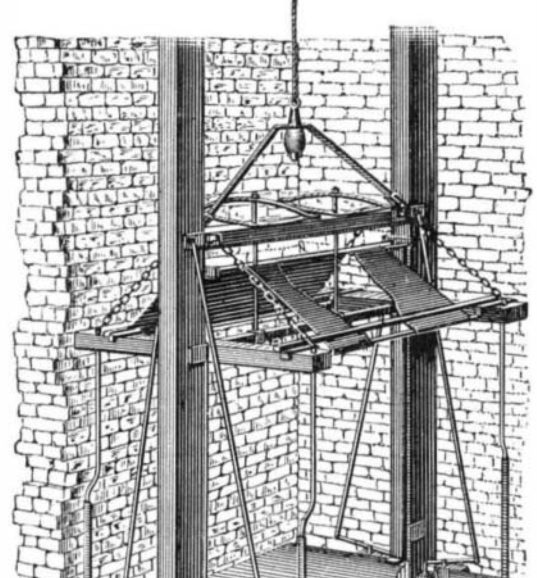
A Foot Fog Horn.

A new fog horn, invented by Mr. Bryceson, has recently been tried on the Thames by the representatives of the Admiralty. It is in the form of a pump, and is worked by a strap fastened to the signalman's foot, and so worked as to produce short or long sounds, as required. The advantages of the invention are, the length of time to which the sound can be drawn out, its cheapness, and the fact that it can be heard for three-quarters of a nautical mile in stormy weather.

SAFETY CATCH FOR ELEVATORS.

From opposite sides of the cage floor rise two standards, whose upper ends are united by a beam. To each standard near its upper end is secured a cross beam, at the ends of which are vertical rods which have their lower ends attached to the corners of the floor. The standards have forked clips at the top and bottom, which embrace the two side guide beams in the elevator shaft. Hung on the ends of the cross beams are stirrup rods, on which rest the free ends of sheet iron tops, which are hinged on rods connecting the upper ends of the standards. Resting upon a rubber spring secured to the lower end of the hoisting cable is a V-shaped inverted hanger, upon the ends of which are pivoted the ends of a bar carrying a beam. Between the ends of the beam and the bar are held clips which embrace the guide beams, and which are formed with outwardly projecting lugs. Chains are attached to clips upon the ends of this beam and to the upper ends of the corner rods. Passing through apertures in this beam are rods secured to the beam uniting the tops of the two standards; upon the upper ends of the rods are held elliptic springs. On each end of the floor a lever is pivoted, at each side of the standard, to the outer ends of which are pivoted rods whose upper ends are joined to the clips. To the inner ends of the levers are pivoted rods which pass through holes in wedge shaped blocks having transverse teeth formed in the faces toward the sides of the guide beams. Blocks are secured to the ends of the floor, in such a manner that their beveled edges face the beveled edges of the lever blocks.

It will be seen that the cage is suspended from the spring rods, the springs being compressed. The beam carrying the springs keeps the outer ends of the levers raised, and the blocks are held a short distance from the guide beams.



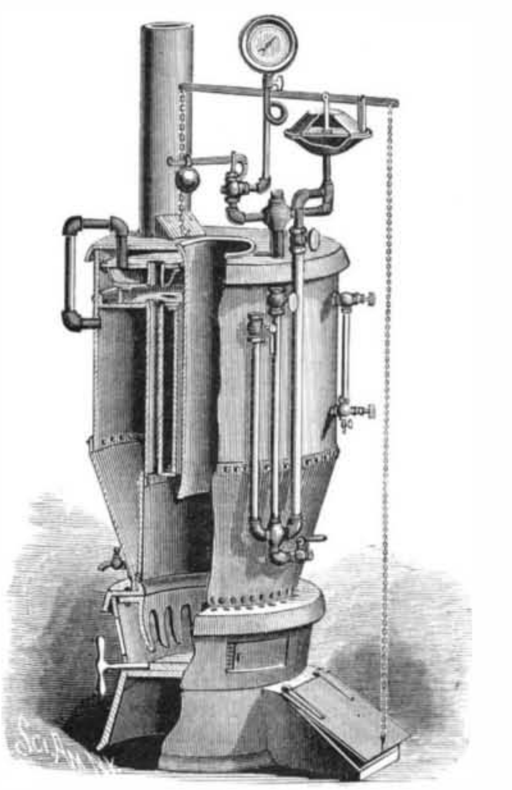
GILES' SAFETY CATCH FOR ELEVATORS.

When the cable breaks, the springs exert a downward pressure, thereby forcing the beam downward, and through the rods and levers pressing the blocks against the sides of the guide beams, firmly locking the car in place.

Further information concerning this invention may be obtained from the patentee, Mr. William Giles, of Mount Olive, Ill.

IMPROVED STEAM HEATER.

Near the middle of the circular cast metal base, having a double conical form, is a shaking and dumping grate, and resting upon its upper edge is a ring shaped plate, to the lower side of which is bolted a ring having downwardly projecting fingers forming the lower portion of the fire pot. The lower edge of the fire pot wall and the boiler shell, which is made conical at its lower end and cylindrical above, rest against an inner flange on the ring plate. In the upper



BOYER'S IMPROVED STEAM HEATER.

portion of the base are openings with sliding doors, through which access may be had to the fire. Between the crown sheet and the top of the boiler are a number of tubes for the passage of the products of combustion; the inside wall of the boiler connects the crown sheet and the fire box.

The top plate of the heater closes in the smoke space and sustains the central magazine, through which coal is fed to the fire pot. Between the crown sheet and the cover is an annular space in which is located an annular steam superheating chamber, which is connected with the steam space of the boiler by an elbow pipe, and from which the steam issues through a pipe to the radiators. Through this chamber there are short tube sections so arranged as to register with the flues below. Connected with the steam pipe there are a steam gauge and a safety valve; a regulator, within which is a flexible diaphragm of soft rubber, is supported by a plugged pipe attached to the delivery pipe. A glass water gauge, a feed water pipe, and a return water pipe are arranged upon the outside of the boiler.

A pipe communicates with the boiler below the water line, and with the under side of the diaphragm in the regulator. A damper in the smoke pipe and a draught damper for the fire pot are respectively connected by chains to the opposite ends of a lever united by a rod with the diaphragm. These parts are so arranged that when the fire burns too freely the increased pressure on the diaphragm moves the lever, closing the draught damper and opening the smoke pipe damper; when the heat and pressure are reduced, the diaphragm falls and the movements are reversed. This insures an automatic regulation of the heat and pressure and the most economical use of fuel.

This invention has been patented by Mr. J. L. Boyer, of Reading, Pa.

The Black Snake Cure for Rheumatism.

The patient is Mrs. H. W. Stevens, wife of the Chief Engineer of the Danbury, Conn., Fire Department. The mode of treatment is to take the snake, which is about five feet long, and wind it about the patient's leg. After remaining for twenty minutes he is taken off and put in a box. This is done two and sometimes three times a day. A month ago Mrs. Stevens could walk only with the aid of crutches. She is now able to walk with a cane, and entertains strong hopes of ultimate recovery. At times the snake will bring his restrictive powers into play, and give a painful squeeze to the leg. A pin thrust into him cures him of this. Several times he has bitten his handlers, but no harm has followed.

We are inclined to think a thin rubber tube filled with warm water might replace the snake, and prove to be more advantageous as a cure.

Aerial Navigation.

M. Herve Mangon has lately presented a report to the Academy of Sciences concerning a recent balloon ascension at Meudon. The balloon was under the direction of Capt. Renards, and, although it moved against the wind, it easily followed the course along which it was steered. It was then veered around and brought back to the point from which it started.

Killing Food Animals without Pain.

Dr. B. W. Richardson's experiments and studies to find the best way of mitigating the cruelties of the slaughter house are well known. His earliest attempts were with electricity; but the use of carbonic oxide gas he now finds is the best.

In the last number of the *Asclepiad*, he says: Respecting the method of killing by the electrical discharge, I reported on the experiments I had made in 1869 with the large induction coil of the Royal Polytechnic Institute, with which I put to full test the practical value of electricity for the painless killing of animals.

I used, in these inquiries, twelve large Leyden jars, the whole representing ninety-six square feet of surface. In some cases the discharge was made in the ordinary direct way; in other instances the jars were set out in cascade on the plan devised by Benjamin Franklin. The results, as many who saw them will remember, were most striking. It was proved that the shock "in cascade" was the most fatal, but by both methods small animals, rabbits, and birds, were killed so instantaneously that they actually remained in the exact position they had assumed at the moment the shock was given, so that it required careful examination to prove that they were really dead. In these small animals the bodies were left, after the shock, in a state of complete rigidity; but in a short time the rigidity subsided, and the flesh ate tender.

The common idea that after death from electrical shock rapid decomposition ensues was disproved, for in all cases the bodies of the animals remained for several days free from decomposition. In another series of experiments, larger animals, sheep, were subjected to the shock, and in every instance unconsciousness immediately followed the application of the shock, the current being passed from the heads of the animals through the body to the hind extremities. The method proved very difficult to carry out in practice, for two reasons. First, it was found that if the shock was so decisive that death took place absolutely, the animal would not afterward bleed; while, if the shock were not completely decisive, the animal, during the flow of blood, evinced certain signs of returning consciousness, a phenomenon as remarkable as it was unexpected. Secondly, it was found that the administration of the shock was dangerous to the operators unless they took such care as could not be expected from all the men who are employed in the duties of the slaughter house.

CARBONIC OXIDE GAS AS THE NARCOTIZER.

Some researches on anæsthesia led me to an exposition of the anæsthetic action of the fumes of the Lycoperdon giganteum, or common puff ball.

These fumes were found to be most actively narcotic, and on analysis of them by two independent observers, the late Dr. John Snow and Mr. Thornton Herepath, it was found that the narcotic present was carbonic oxide—CO. On this being determined I commenced to follow up the study of carbonic oxide, and in course of time employed it as one of the cheapest and readiest of the lethal gases for the painless extinction of life in the lower creation, using it frequently for narcotizing sheep, birds, and dogs.

In 1878 I constructed, for the first time, a lethal chamber, in which sheep were introduced in order to be rendered insensible by this gas before being subjected to the slaughterer. The chamber was capable of receiving two sheep at once, and the carbonic oxide was made by passing common air in a simply constructed stove over charcoal. The gas diffused through the chamber was sufficiently effective in its action to render the animals insensible to pain in a period of from one minute and a half to two minutes. When entirely unconscious they were removed from the chamber, and finally killed by the butcher in the usual way.

These animals had no sense whatever of the violent death to which they were subjected. They felt no more of the slaughterer's knife than the patient under chloroform who is about to have a limb amputated feels the knife of the surgeon. When they had lost the quantity of blood that is required to produce the phenomenon, the usual death convulsion incident to loss of blood occurred, but it was painless and very short in its duration.

The flesh of the animals—eight in number—killed in this painless manner was entirely unchanged. The gas combines harmlessly with the tissues, it communicates neither odor nor taste to them, and is, in short, entirely innocuous to the flesh as food.

In the painless slaughter of animals intended for food there need be no hesitation in the selection of the narcotic. Carbonic oxide is the right agent in every respect.

The painless death of animals to be used as food might be put into operation at once in a properly constructed abattoir in the case of sheep, lambs, calves, fowls, rabbits, and other game, pigs, and perhaps oxen. Of the oxen I am not sure, the pole ax being so very speedy and effective when it is properly used.

For sheep the narcotic is specially appropriate. Sheep come under the influence of the narcotic with singular facility, and are saved from what is to them a very painful death.

Through the generosity of one benevolent man, Mr. Kennet, I have constructed at the Dog's Home at Battersea a large lethal chamber in which from fifty to one hundred dogs can be narcotized at once, and can be allowed, without awakening, to pass from sleep into death.

On May 15 of this year, I put the chamber, for the first time, into practice, by passing into it thirty-eight dogs which had to be killed. The animals were quickly asleep, and when removed from the chamber were all lying precisely as if asleep, but every one dead.

On the 21st of May fifty-four dogs were submitted to the same mode of death in the lethal chamber. They fell asleep in the most direct and easy way; and on removal from the chamber were all found lying as if asleep, but quite dead.

The same process has now been repeated many times on batches of dogs varying from fifty-three to eighty-four at one time. On the whole, five hundred dogs have been in this way made to sleep into death—have been submitted, that is to say, to death, with no more sense of pain than is felt by every human being who goes to sleep from the hand of the administrator of an anæsthetic vapor. The death is the easiest it is possible by any art to devise. First sleep, then death sleep, then death.

The lethal chamber is an air tight chamber built of wood, with double walls holding a layer of sawdust between them, so as to sustain an equable temperature, and secure an equable diffusion of the lethal air within the chamber at different seasons. The chamber is capable of holding two hundred cubic feet of lethal air, and is constructed to receive a cage having a capacity of one hundred and forty cubic feet.

The cage runs easily on wheels into and out of what may be called the central nave of the chamber. As it enters it pushes before it a valve screen, which prevents the escape of lethal air; it also pushes before it, at the further end, a movable screen to allow for the displacement of the air caused by its entrance.

When the lethal chamber is required for use, the carbonic oxide is generated freely in the stove condenser, one pound of charcoal being used for the production, excluding loss, of every twenty-five cubic feet of gas. For three hours the gas is diffused into the chamber at a temperature of about 75° F., and at the rate of one hundred cubic feet per hour. The chamber is thus well filled with a lethal atmosphere, through which finally the methylated vapor is rapidly diffused.

The chamber ready, the animals are put into the cage outside of it. The first doors of the chamber are then thrown open, and the cage, pushing before it the valved screen spoken of above, is run in. Its own end closes up the entrance; but to make all perfectly air tight, the outer door of the chamber is immediately closed. The animals are now immersed in the lethal or narcotic atmosphere. The whole time of introduction of the cage and closing of the chamber is less than half a minute.

At first the animals are, as a rule, completely quiet; then they seem, one by one, rapidly to fall into deep sleep, often with heavy snoring; finally, with a series of short, sharp barks, in some cases, they fall into death, the perfect placidity in which they are discovered after death indicating that they have passed imperceptibly from sleep into death.

It is important, however, for me to record that all animals after they have fallen into sleep under the lethal vapor do not pass into death with equal rapidity. About 3 per cent of animals, after the narcotism is fully established in them, show such a peculiar tenacity of life that they may continue to breathe for some time after the rest of their comrades are dead. In these instances it would seem that the animals, brought down to the very lowest possible ebb of life, retain a sufficient reserve of oxygen to keep the flame of life alive.

They are like animals hibernating in the extreme cold. The same phenomenon has been observed in the human subject in cases of exposure to lethal vapors in mines.

The idea that an atmosphere charged with 5 per cent of carbonic oxide is instantly fatal to all warm blooded animals is an entire fallacy. Some animals may be as rapidly affected, but others may continue to live a long time in an atmosphere containing at least five times that proportion of the gas.

These experiences have led me to increase the intensity of the lethal atmosphere far beyond what would, up to the present time, have been considered necessary.

The atmosphere of the lethal chamber is not merely anæsthetic; it is also antiseptic. The dead animals can, therefore, be preserved in it, if required, while awaiting removal.

Horse Breeding in Russia.

An interesting account is given in Consul-General Stanton's last report of horse breeding in Russia. He says that the horse has played an important *role* among the inhabitants of the steppes from the eariest period of the history of the Slavonic breeds. Oley, and succeeding princes, took measures to improve the breeds, and Yaroslaff punished horse stealing by loss of liberty and fortune; but until the middle of the 13th century the Russian Government was lukewarm in the matter of encouraging the breeding or improving their breed of horses. From the time of Ivan III., government measures became more systematic, imperial studs were established, thoroughbreds purchased, and stallions were lent to boyars and monasteries for breeding purposes.

At the present time there are six imperial studs: The Orloff, where English thoroughbreds, trotters, and saddle horses are reared; the Novo-Alexandrofsk, for English halfbreds and large horses; the Strelitz, for Oriental saddle horses; the Derkulsk, for farm and carriage horses; the Tanoff, for large saddle horses and English halfbreds; besides these there was, until 1881, a stud at Orenburg for breeding steppe horses.

There are fifteen covering stations, which are open to all. The stallions are distributed each year from February 15 to June 15 among these stations, and here mares are served by thoroughbred stallions at a fixed rate. In 1881 there were 1,077 stallions at the 15 stations, and 39 stallions were placed at the disposal of the agricultural establishments at separate stations. The imperial studs, after replenishing their stock, dispose of their increase by auction every four years. The thoroughbred Orloff colts are, however, sold each year. In 1880, 555 horses and 15 foals were sold for £11,480; and in 1881, 687 horses realized £10,064. Three thoroughbred English and two Arabian stallions were added in 1880, and eight English thoroughbreds in 1881. The department receives annually about £11,450, to be spent in encouraging private breeding establishments. At present there are eight jockey clubs and twenty-seven trotting establishments. There are 3,430 private studs, with 9,560 stallions and 92,971 mares. Besides these, a large number of horses are bred in herds on the steppes, chiefly in the governments of Semipalitinsk and Akmolinsk. The total number of horses in European Russia, exclusive of Poland, is 17,785,975. In the Caucasus there are about 500,000, in Siberia about 2,500,000, and about the same number in Central Asia.

In consequence of the varied elements from which the modern Russian horse has been developed, and the manifold character of the climate, topography, etc., in Russia, the horses are of very different types, viz.: Mountain horses, to which group belong horses of Oriental extraction, and bred in Caucasia; they are characterized by medium size and great beauty, and on account of their speed and sure footedness they are especially adapted for riding and driving in mountainous districts. Steppe horses, which are the horses of the Don, Calmuck, and Bashkinian races; they are characterized by leanness, great powers of endurance, and a contented disposition. Forest horses; to this group belong the Smudish, Obrimian, Viatkan, and Kasan horses, which are bred in the northern forest regions. And, finally, horses of the Blackearth districts, which are large and powerful cart horses. Besides these breeds there are also the Polish and Little Russian breeds.

Horse dealing is concentrated in the yearly markets, of which there are about 1,090 in European Russia, and the total number of horses sold in these markets averages about 360,000 annually. A considerable sale of horses is also carried out throughout the Empire, irrespective of these markets, and 15,000 are annually sold in Moscow alone, at prices ranging from £8 to £9, and a number of Orloff horses, which command from £400 to £500 each. The total value of the horses annually sold in Russia is estimated at £1,000,000. Prices vary considerably, according to season, age, and race, the average price of a common horse being £5, that of a good cart horse from £10 to £30, a good trotting horse from £400 to £600, and of a good cavalry horse from £8 to £15.

A New Metallurgical and Gas Process.

A new system of iron and steel making has been devised by M. Louis de Soulages, who has constructed works at Montjean for the purpose of developing his designs. The general idea of the process, as stated in the *Revue Industrielle*, is divisible under two heads—the preparation of the ore, and its reduction by a flame of carbonic oxide. In the first place, M. De Soulages holds that the connection of a mineral with its *gangue* is due to the presence of one or more molecules of water of crystallization or combination, which, if evaporated, will permit of the easy separation of the two substances. Upon this hypothesis, therefore, the first step is to pulverize and dry the mineral, which is afterward subjected, while in the form of anhydrous dust, to the intimate action of carbonic oxide. In practice the mineral is first broken small by a Blake machine; and it is then ground by cylinders into grains of from 1 to 3 millimeters in diameter. After this it is dried and screened into three sizes by volume; and it is then separated according to gravity. In this way the raw material is collected free from dross, perfectly dry, and ready for the chemical operations of reduction and melting. For this purpose the gaseous fuel is prepared in a peculiar manner. Retorts (vertical ?), heated by coal, contain carbonate of lime in their lower portion, and wood charcoal above. The heat disengages the carbonic acid, which becomes transformed into carbonic oxide by traversing the wood charcoal, and the gas is then collected in a gasholder for use in the reducing furnaces.

After being used in this way the carbonic oxide becomes carbonic acid; and it is then conducted to other retorts which are divided into two parts, and heated by the carbonic oxide from the gasholder. The upper parts of these retorts contain wood charcoal; and the conversion back to carbonic oxide is performed as easily as in the first operation, but without the necessity for extracting carbonic acid from carbonate of lime.

For the successful working of the reducing process it is essential that the hearth where the operation is carried out should be kept free from the admission of air; but to raise the temperature by the combustion of the carbonic oxide, a regulated supply of air is admitted from a suitable reservoir. After the heat has thus been raised to about 1,500° C., the combination of the carbonic oxide with the molecule of oxygen contained in the metallic oxide under reduction will keep up the temperature without further aerial combustion. No results of the application of this system have been given; but while the fact that it depends wholly upon theoretical data is admitted, it is pointed out that all the remarkable metallurgical advances of modern times have equally been based upon pure theory.