RAILWAY RIVETING MACHINE.

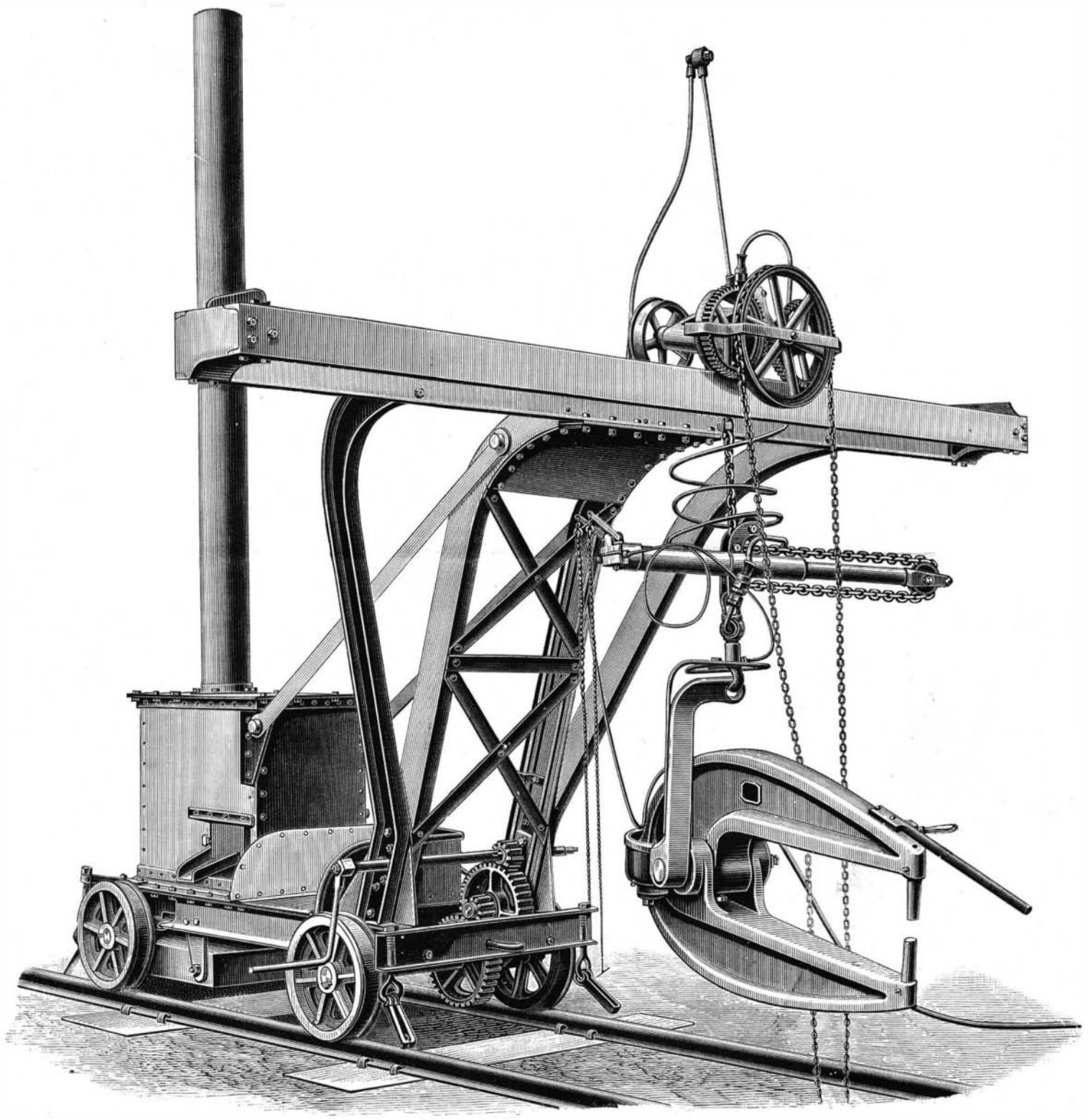
We illustrate a novel arrangement of a portable riveting machine and crane on Mr. Tweddell's well-known system.

The machine in question forms only a part of a very complete traveling plant, designed and manufactured by Messrs. Fielding and Platt, to the order of Mr. Arthur Sullivan, who is at present engaged in the construction and erection of some bridges on the Southern Mahratta Railway. The arrangement consists of a trolly or carriage, upon which is mounted a crane, carrying the riveting machine. By means of a cross gantry the latter is able to be moved in a transverse direction during the time the machine is engaged riveting. The trolly retires as the construction of the bridge progresses; the connection with the pressure main is never interrupted, as the flexible pipes and swivel joints allow for any change of position; a hydraulic chain lift adjusts the position of the machine vertically.

On the same trolly is also mounted a reverberatory rivet-heating furnace, which enables a considerable quantity of rivets to be always ready. The portable riveting machine, which is of the "Fielding" type, and has a gap of 42 in., is capable of closing rivets of 1 in. in diameter.

The riveting machine as shown is in proper position for riveting up the floor-plates of the bridges; it is, however, obvious that the machine can be used with a lever, vertically or horizontally, or at any intermediate angle.

In addition to the crane and riveter illustrated, a motive power trolly is supplied, on which is fixed the steam engine, boiler, accumulator, and pumps. Supplied from this same power trolly are also other travelers carrying spare riveters for different parts of the girders. The object of thus subdividing the plant is of course to minimize as much as possible the load to be carried by the girders during construction.—*Engineering.*



IMPROVED HYDRAULIC RIVETING MACHINERY.

WHILE the eruptions of the volcano Krakatoa and the shocks at Java were proceeding, it was impossible to use the telephones at Singapore, in consequence of the noise in the wires. The sound was like that of a distant waterfall. On one line, part of which was submarine, detonations like pistol shots were heard.

The Invention of the Telegraph.—"Honor to Whom Honor is Due."

That the discoverer of some important truth or scientific principle remains often unknown, and his merits unacknowledged, is Mr. Fahie's reason for contributing to the *Electrician* an account under the heading above, with a chivalrous desire to do justice to the claims of Mr. Edward Davy to priority in the invention of the electro-telegraph.

The subject of this sketch was born in 1806, was educated in London; in 1828 he became a member of the Royal College of Surgeons, and is now living in Australia at the age of seventy-seven.

Mr. Fahie bases these claims upon a number of MSS., which, narrowly escaping destruction by fire as rubbish, were found by the nephew of the inventor, Dr. Henry Davy, of Exeter, who placed them in Mr. Fahie's hands.

In his very interesting narrative, Mr. Fahie writes that the idea of the electro-telegraph first occurred to Davy in 1836, when he sketched out a plan to be worked by statical or frictional electricity; this he soon replaced by the Voltaic current. He considered the Daniell battery, then just invented, or a magneto-electric machine as made by Newman or Clarke, to be the best source of electricity; this was to be set in motion by keys resembling those of a piano, connected to their respective wires. On pressing a key, its wire would dip into a cup of mercury connected with the source of electricity, and thus a communication could be established and broken when the finger ceased to press the key.

Improvements followed, and in 1837 his ideas had assumed a really practical form, his apparatus being so far complete as to submit to the test of actual experiment.

About this time Davy became alarmed by the rumors that Prof. Wheatstone was engaged on an electric telegraph; he at once lodged a *caveat* and deposited an account of his invention with the Society of Arts.

In May, 1837, Cooke and Wheatstone applied for their first patent, to which Davy entered an opposition, lodging at the same time a full description of his apparatus with the Solicitor-General, who decided that the two inventions were different, and allowed the patent to pass; although, according to Davy's account, "time has since shown that they contained some of the clearest identities."

The long pending decision upon Davy's application for a patent was at length given in his favor in July, 1838, Faraday being referred to as the highest electrical authority. Davy now tried to induce various companies to make use of his invention, many of whom almost promised to adopt his system.

Why then did he fail? He had no powerful friends; his father, who might have been of great help to him, thought him a visionary and his plans "*moonshine;*" but it was chiefly because he left England just at the wrong moment. This he himself did not realize, thinking that when the bargain was made, for which the companies were ready and willing, affairs could be managed by an agent or attorney as well as if he were present.

Subsequent events showed how erroneous this idea was, for the directors of the companies wishing to use his invention, having no one who thoroughly understood his instrument, adopted that of Cooke and Wheatstone.

In 1840 Davy's machines were stowed away in an outhouse of Ottery St. Mary, and Mr. Fahie, hoping to find some interesting remains, visited the place, but to his disappointment found that they had all been sold as old iron. In a field near by were found some pieces of cotton-covered iron and copper wire, and six of the Daniell cells—huge things of three or four gallons capacity! Which relics are carefully preserved. And so ends what Mr. Fahie calls "a magnificent failure."

Monument to the Inventor of the Hot Blast.

A monument in memory of Mr. James Beaumont Neilson, of Queenshill, inventor of the hot blast, has been erected on Barstobrick Hill, Queenshill estate, near Kirkcudbright, by his son, Colonel W. Montgomerie Neilson. The monument is shaped after the pyramid style, and is built of large blocks of whinstone, with granite corners. Occupying a commanding position, it rises to a height of 55 feet, and at the base is 20 feet square. On the north side is the inscription: "1883. W. M. N. Fecit." On the south side: "Neilson Hot Blast, 1828."

Compressed Air Motive Power.

A company has been formed in Birmingham, Eng., for the distribution of compressed air through pipes under the streets for motive power. Among the advantages claimed are, the facility for starting workshops; the lessened capital required for this purpose; the consequent enhancement of the value of property; and the obvious hygienic advantages from using pure air instead of continuing the pollution of the atmosphere by the emanations from a large number of small factory chimneys. It is also claimed that compressed air can be applied to existing steam engines "without involving any change of plant, or imposing one farthing of expense upon the present users;" while enabling them to dispense with their boilers and all the concomitant smoke, dirt, danger, and cost of attendance. It is promised, that users will have the new power 20 per cent cheaper than the old, after paying the company supplying it a dividend of at least 10 per cent. The engineers of the new scheme have, says the *Journal of Gas Lighting*, inquired into the cost of small steam power in Birmingham; and they make it out to be not less than £10 per horse power per annum. This is the ascertained average rate of cost for from 10 to 30 horse power obtained in the usual manner. Now, in the scheme, as at present proposed, it is intended to provide for the delivering of 5,000 indicated horse power; this being the estimated requirement, obtained by canvassing the area selected. As a matter of fact, the consumption of steam power in the wards which it is proposed to serve with compressed air—Deritend, St. Martin's, and St. Bartholomew—is about 10,000 horse power nominally; half of which is thus estimated to be replaced by air power. This is to be produced at works situated on the Birmingham and Warwick Canal, where, on half the site available, four air compressing engines, driven by compound condensing steam engines, giving a total of 8,400 indicated horse power, are to be erected, supplied with steam from 44 boilers, fitted with improved furnaces and stoking machinery. Before entering the compressing cylinders, the air will be filtered, to deprive it of soot and dust. The air pressure to be delivered has been fixed at 45 pounds effective above the atmosphere (or 59·7 pounds absolute), as being sufficient for the majority of cases, and more economical of production than a higher pressure. The trunk main from the works will be 30 inches in diameter, and throughout the manufacturing quarter the mains will run through every street, the smallest being 4 inches. The total estimated capital outlay of the undertaking, including a liberal allowance for patent rights and expenses, is just under £200,000. The estimated annual expenditure is £21,000, as against an income of £45,000; thus showing a profit of 12 per cent.

The air as stated is to be compressed to 45 pounds, or three atmospheres above the initial or normal atmospheric mean. At this pressure the output from the works will be 247 cubic feet per second, and the extreme length of the district is 6,000 feet. The calculated loss of pressure by friction in the mains is only 3·06 per cent; but to allow for all contingencies 5 per cent is assumed. Then comes the question of leakage, which is estimated at 10 per cent. No data for this figure are offered; and it appears somewhat low when gauged by the experience of gas distribution under very much lower pressures. It must be understood, however, that the distributing plant will be quite new, and very strong; and that air is not so likely to escape as gas. It may therefore be granted that, although the company expect to lose 10 per cent of pressure by friction (or a reduction from 45 pounds to 40·5 pounds per square inch), and 10 per cent in bulk, they will be very fortunate if their losses are kept within these limits.

It should be remembered that for ordinary use the air as delivered to the consumer will be required to be heated before expansion, in order to obtain the maximum of effect and to avoid the cold that would otherwise follow the sudden dilatation. A temperature of 320° Fah. is calculated for this purpose; but as the user's boiler furnace is supposed to be abolished, how is this heat to be obtained in workshops and warehouses where there are no other furnaces? Here, it would seem, is a good opening for a special appliance to be heated by gas—the only certain and regular source of heat for a purpose of this kind. If the compressed air were caused to pass, on its way to the motor, through a cluster of vertical tubes, at the bottom of which a ring burner were placed, the whole being inclosed in a casing, all difficulty on the score of reheating would be met. On the other hand, it is expected that useful work may be found for the compressed air, when allowed to drive an engine and afterward expand, producing intense cold. For keeping provisions in hot weather, or for brewers, etc., a refrigerating effect of this kind would be found very valuable. It is, indeed, estimated by the engineers that, although half of the power supplied may be sold at about 20 per cent under the average cost of small steam power, the great convenience of the compressed air service will bring it into demand for purposes for which steam power is not adapted, and for which a slightly higher rate may be easily obtained.

Stuffed Spiders.

When it comes to a real live, energetic, ugly, vicious, poisonous spider, says the Santa Barbara *Independent*, Southern California can enter prize animals at any fair. The most precious trophies the tourists bear away from this coast are, in all probability, the neat cards decorated with these monsters of the insect world. Every one is familiar with the trap door and nest of this cunning but ugly creation, and of which strange little habitations every adobe ranch is full. So densely populated with these beautifully lined tunnels are some of the sunny, quiet valleys among the foot hills, that close inspection will reveal their almost invisible trap doors hardly a foot apart. Yet, in spite of this, hardly a living animal will be seen. There is a legitimate demand for prepared specimens, both at wholesale and retail. When first brought in they are deprived of what life is left in their bodies by poisonous fumes or other application of poison. After the taxidermist has made sure they are quite dead—a wise precaution—he cuts them open on the under side and, removing the loose matter therefrom, carefully stuffs them with cotton. This stuffing process is quite a delicate operation, and requires no little knack to perform neatly and successfully, without injuring the animal, and bringing it back to its normal shape and size. A humming bird would seem to be about as small an object as could easily be put through this painstaking operation, let alone an insect even of the size of a tarantula. This having been completed, the spider is placed upon a board and properly held in position by pins, one through the body and one in each foot, and set in the sun to dry.

The sale of them in Santa Barbara is carried on both at wholesale and retail, several parties carrying on the business. The retail price is 50 cents apiece, one merchant disposing of many dozen a year in that way. The wholesale operations are confined to supplying the natural history stores of San Francisco, which establishments pay $3 per dozen for well prepared specimens, the supply seeming never to crowd the demand. In spite of their great numbers, few instances occur where people have been bitten by them, the tarantulas generally being more anxious than the other party to get out of the way.

Taming Wild Humming Birds.

A lady residing at San Rafael, one of the many pleasant health resorts of California, has sent to friends in London an account of the taming of two free wild humming birds by her daughter, who, under medical direction, has for some months passed several hours daily reclining on rugs spread on the garden lawn. "E. has a new source of interest," her mother writes. "The humming birds have claimed her companionship and manifested their curiosity by inspecting her, with their little wise heads turned to one side, at a safe distance, watching her movements, evidently wishing to become acquainted. To entice them to a nearer approach, E. plucked a fuchsia, attached it to a branch of a tree over her head, and filled it with sweetened water. The intelligent little creatures soon had their slender bills thrust into the flower, from which they took long draughts. Then E. took honey, thinking they might prefer it, and filled a fresh flower each day. They would sometimes become so impatient as scarcely to wait for her to leave before they were into the sweets, and, finally, while she held a flower in one hand and filled it with drops from a spoon, the now tame little pets would catch the drops as they fell, and dart into the honey cup their silvery, threadlike tongues. E. is delighted, and so fascinated with them that she passes hours each day of her resting time talking to them and watching their quick, lively movements. Although these tiny birds are humming all day among the flowers, two only have monopolized the honey-filled flower, and these are both males, consequently there are constant squabbles as to which shall take possession. They will not permit a wasp or a bee to come near their honey flower, and not only drive them away, but chase them some distance, uttering a shrill note of protest against all intruders." Referring to them again, at the close of the rainless Californian summer, in a letter dated October 26, this lady writes: "We have had threatening clouds for two days and a heavy rainfall to-day. E. has continued her devotion to her little humming birds. Since the change of weather she has tried to coax them to the parlor windows. They appeared to think there must be some mistake, and would hum about the window where she stood with the honey flower and spoonful of honey, or they would sit on a branch and watch every movement, yet not daring to take a sip until to-day, when at her peculiar call, which they always recognize, one ventured repeatedly to take the honey from her hand."

Electric Gas Lighter.

The covered street at Milan, now well known as the Victor Emmanuel Gallery, is roofed with glass, and completed by a large dome, round the interior of which runs a chain of gas lamps. The lighting of these lamps at a considerable elevation used to present some difficulties, and was always a source of risk, until an arrangement was made for doing the work by electricity. A miniature railway has been constructed close to the gas burners, on which runs a little electric locomotive carrying a wick steeped in spirits of wine. When it is desired to light the burners, this wick is set on fire and the locomotive started on its career. It flies round, rapidly kindling the circle, and exciting great interest among the crowds that assemble nightly to witness the performance.

Liquefied Carbonic Acid.

The fact that carbonic acid gas under a pressure of thirty-six atmospheres and at a temperature of 0° C. passes into the liquid state has been known since the earlier days of Faraday's career, but until recently has been turned to little practical account. A few months since, however, some interest was excited by the statement that liquefied carbonic acid was being advantageously used in the manufacture of aerated beverages, and quite recently, at a meeting of the London Section of the Society of Chemical Industry, the apparatus contrived by Dr. Raydt, of Hanover, in conjunction with Messrs. Kunheim, of Berlin, for facilitating the industrial application of Faraday's discovery was explained by Mr. A. Zimmermann. Of course the important part of the problem consisted in providing a vessel capable of holding the acid under the necessary pressure and yet so that it should be available when required. This is effected by constructing a wrought iron cylinder of about ten liters capacity, representing a quantity of liquid acid which is sufficient when liberated from pressure to yield about 4,500 liters of carbonic acid gas of ordinary density. At one end and screwed into the metal of the cylinder is an exactly finished brass screw valve tap, somewhat similar in principle to a high pressure water tap, by which the exit of the gas can be controlled, so that it may pass into the gasometer or other vessel at any rate desired. It was one of these cylinders that was submitted to the inspection of the meeting referred to, and it was stated that each cylinder is certified to withstand a pressure equal to two hundred and fifty atmospheres. In fact, it is claimed that it has been experimentally proved that, with a temperature of 200° C., the enormous pressure of twelve hundred atmospheres can in this way be made applicable.

The brewing industry in Germany has been one of the first to avail itself of the practical advantages resulting from this invention, in using the pressure resulting from the vaporization of the liquid acid for the purpose of raising lager beer from the cask to the place of draught, instead of condensed air pressure, which in some districts is prohibited on account of the usually impure condition of cellar atmosphere. An interesting experiment is also stated to have been made with cloudy beer in an English brewery, when it was shown that instead of keeping the beer in continuous agitation, as was generally expected, the pressure of the liberated gas acted uniformly and steadily on the top of the liquid. In this way, it is affirmed, all the suspended matters, to which the cloudiness was due, were precipitated by mechanical pressure, the hops floated on the top, and bright beer could be drawn from the intervening space. It is also anticipated that the invention will be utilized by engineers in various way. Already in Kiel harbor a stone, weighing about fifteen tons, has been raised from a depth of thirty-five feet by attaching to it a vessel inflated from one of the cylinders. At Essen, Herr Krupp is said to take advantage of the pressure obtained by the liberation of the gas to condense the molten iron while cooling in the mould. Further, its use for blasting operations and in locomotive engines has been suggested.—*Pharmaceutical Journal.*

Removing Spots from Gilt Frames.

Gilt frames are liable to become spotted and look bad, while it is, as a rule, difficult to remove the spots. Rubbing does not answer, for the stain sticks tighter than the gilding itself, and washing is liable to loosen the gilt if put on with gum or dextrine.

The *Papier Zeitung* recommends the following method of renovating gilt frames. It consists in applying with a camel's hair pencil a gum solution to which has been added gold bronze having the color of the frame. Before mixing with the gum water the bronze must be washed with water until it runs off perfectly clear. If one application does not suffice it may be repeated until the spot entirely disappears, but of course one coat must be dry before the next is applied.

Spots treated in this way look very well at first, but it will not last, for it is not able to resist the moisture in the air unless it is specially prepared. For this purpose an ordinary bristle brush is rubbed with a piece of yellow wax until it is somewhat sticky, then it is passed very lightly over the spot several times as when dusting it. This gives it a very thin coat of wax that hardens in two or three days; in the mean time it must be protected against dust.

Improvement in Developers for Gelatine Plates.

Mr. Henry J. Newton has lately discovered a new solution, which when added to the ordinary carbonate of soda developer increases its developing power fivefold, thereby allowing sensitive plates in the camera to be exposed a much shorter time than is usual.

He makes the following solution: Water, 4 ounces; in which is dissolved bichloride of mercury, 60 grains; into this solution is poured a solution of idodide of potassium, 90 grains; water, 1 ounce. To every two or three ounces of the soda developer he adds from two to three minims of the above solution.

Clear negatives of good tone and quick printing quality are produced. Details in the shadows are brought out with greater facility. It is especially useful in the development of plates which have had an instantaneous exposure. He also found 2 or 3 minims of a solution of 150 grains of iodide of sodium to one ounce of water had a quickening effect, but not so much as the mercury solution.