

MILLEFLEURS.

Ext. Rose.....	iv.
Ext. Tuberose.....	iss.
Ext. Jasmin.....	iss.
Ext. Orange flower.....	iss.
Ext. Cassie.....	iss.
Tinct. Vanilla.....	j.
Tinct. Ambergris.....	ss.
Tinct. Musk.....	ss.
Oil Neroli.....	xlxv.
Oil Bergamot.....	xlxxx.
Oil Cloves.....	xlviij.
Oil Almond.....	xlviij.
Rose water.....	xlviij.

TUBEROSE.

Ext. Tuberose.....	f. xij.
Tinct. Vanilla.....	f. j.
Rose water.....	f. ij.
Ext. Jasmin.....	f. ij.
Pulv. Orris.....	3 ij.
Cologne spirit.....	f. 3 j.

COLOGNE WATER.

Oil Neroli.....	f. 3 iv.
Oil Bergamot.....	f. 3 iv.
Oil Lavender.....	3 ij.
Ext. Jasmin.....	3 iiss.
Cologne spirit.....	Ovj.
Water.....	Oij.

Cologne water made by the formula given is an agreeable perfume, and has the soothing and cooling properties desirable in such a preparation.—*American Journal of Pharmacy*. [For a series of additional recipes for perfumery with further directions, see the excellent paper by W. Saunders, in SCIENTIFIC AMERICAN SUPPLEMENT, No. 65.]

THE LONTIN ELECTRIC LIGHT.

It has long been acknowledged by electricians that for brilliancy and reliability the Serrin lamp left little to be desired, and it seems that that little has now been supplied in the Lontin, which is one step forward in the development of the same system. A number of scientific gentlemen and electricians lately met at the Three Nuns Hotel, adjoining the Metropolitan Railway, Aldgate, London, to hear, previously to examining the light in use on that line, an account of the progress made in perfecting the Lontin apparatus. The Lontin light has for some time past been and still is in successful use in Paris, and is not unknown to the inhabitants of and visitors to London, being that which was for some time exhibited in the Strand during last winter by Mr. John Hollingshead, of the Gayety Theater. Since that time, many little imperfections noticed by those interested have been remedied, and eight lamps are now in use at the Aldersgate-street Station of the Metropolitan Railway. At the meeting in question, the chair was occupied by Mr. Myles Fenton, the general manager of that line, and Mr. G. P. Harding, who first introduced the light in this country, and in whose workshops at Paris the machinery is at present constructed, having explained the details of the improvements which had been introduced since the system was first brought before the public, there was an interesting discussion, in which Mr. W. Crookes, F.R.S., Mr. Tomlinson, the engineer of the Metropolitan Railway, and others took part. The opinion was without exception favorable to the quality and efficiency of the Lontin lamp, but some fear was expressed that the present high price would probably limit its application.

The economy of the system was ably maintained by Mr. Bernard Godfrey, the engineer of the Lontin Light Electric Generator and Light Company, who, by the aid of samples of the various forms of the lamp, showed very clearly the progress made up to the present time. He explained that the first cost of the lamp was really less important than at first sight appeared, owing to the small number of electric lamps required for a given space and their durability, but to meet this popular objection efforts were still being made, and he hoped before long they would have a lamp in which the clockwork was entirely dispensed with, the result of which would be that even in first cost the Lontin would compare favorably with any lamp known. It is but nine months since the first practical application of the electric light for public illumination was initiated in London with the Lontin system at the Gaiety Theater, and it has already, in spite of the indiscretion of over-sanguine projectors and the detraction of opponents, become admittedly a method of lighting which public bodies have to reckon with, being alone adapted, on the score of power, salubrity, cleanliness, and economy, under its present improved and improving conditions, to satisfy certain large special requirements. It is to meet these special wants that the above company has acquired the only complete system of lighting which now exists. In fact, without in any way depreciating the brilliant results obtained by other inventions, it may be fairly stated that, whilst one company deals with a machine of which the subdivision is limited, and another company with the utilization of a burner or candle, each having its special feature and being dependent on others for the rest, this company holds not only the Lontin generator, but also the regulators, lamps, and methods of subdivision which enable it to supply from its own resources a complete and practical system of lighting which is neither disagreeable in color nor painful to the eye.

It was claimed for the Lontin light that it has decided advantages over its rivals in steadiness, in divisibility, and in economy, the cost of the Lontin being 3d. as compared with 5½d. for the next cheapest light. The illumination of the Aldersgate street Station on Monday evening was brilliant in every part, although but eight lamps were used to light the whole of the platforms. The lamps were on four circuits, and the currents were supplied from a Lontin generator producing alternate currents and making only 400 revolutions per minute. The motive power was obtained from a Fowler's semi-portable compound engine, high pressure cylinder 9 in. diameter, and low pressure 16 in. diameter, with about a 14-in. stroke. The steam was used at 112 lb. pressure on the square inch, and the engine was making about 130 revolutions per minute. From these data practical men can calculate approximately the number of indicated horse power used. It is intended with the same machinery to illuminate the Moorgate-street and Farringdon stations also, which will be a severe and conclusive test of the efficiency of the system. It is stated that the light may be divided very greatly. As many as twelve lights have been placed in one circuit. It has been shown practically that by this machine it is possible to give a larger number of small lights; and so far as experience has hitherto

gone, whatever loss there may be in illuminating power is much more than compensated by the convenience of so complete a distribution; however, curiously enough, up to a point which at present appears to be between four and six lights on a circuit, a positive gain is obtained by division. These experiments are not yet completed. A machine constructed nominally for twelve lights (which would mean twelve lights of 600 candle-power each), may be arranged to produce 48 lights, should the nature of its application make such division desirable. The various patents which are the property of this company include special regulators and lamps, as well as special materials for cables and insulation, so that the whole apparatus necessary for the purposes of electric lighting used in this system is to a great extent peculiar to itself, and constructed under its own direction and control. The experiments on Monday evening were in every respect satisfactory, and promise much for the future of the light.

[Nature.]

THEORY OF THE TELEPHONE.

EXPERIMENTS that I have recently made with a Bell telephone have convinced me that the sounds produced are the result of molecular change in the iron disk, and are the same in kind as those heard in the telephone of Reiss.

My experiments were made with a carbon transmitter and Bell receiver, using a small battery to generate the current. First I removed the bar magnet from the receiver, in accordance with a suggestion made by a writer in *Nature* some months ago. The effect without the magnet was the same as with it. It then occurred to me that the intensity of the sound might be increased by using two disks instead of one. Accordingly I cut two circles out of a piece of sheet iron, leaving a narrow strip of the metal to connect them, of sufficient length to enable the disks to lie on either side of the reel, so as to form, in fact, an armature to the electro-magnet. On experimenting with this my anticipations were fully realized, the sound produced being more than double that from a single disk.

Now, while trying these experiments I held the disks loosely in my hand, without their being in any way fastened to the wood holding the reel, the effect being the same as if firmly secured. In fact, a common dinner knife or a rough piece of iron would emit sound if brought near enough to the core of the electro-magnet.

I have since constructed a very efficient telephone receiver out of a block of wood two inches square and three-quarters of an inch thick. I then drilled a hole sufficiently large to receive the reel, and covered the block with thin sheet iron. It needs no ear-piece, and forms the most effective telephone receiver that I have seen. But, still further to prove that the sounds produced are due to the magnetization of the iron of the disk, and not to mechanical vibrations resulting from the electro-magnet, I made an iron reel, the flanges of which were two inches in diameter. Now, on covering the reel and placing it in circuit, the flanges of the reel gave out sound as clearly as in the Bell telephone. In my judgment this experiment renders it conclusive that the sounds proceed from the magnetization and demagnetization of the iron, and are therefore precisely the same in character as those formed by a Reiss receiver.

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THE CONSOLIDATION OF FLUID STEEL.*

By ALFRED DAVIS, Westminster.

THE difficulty of obtaining solid ingots under the ordinary system of casting in the Bessemer and Siemens process has induced several methods of applying pressure to the metal whilst in a liquid state.

Sir Henry Bessemer, in 1856, took out a patent, under the title of "Manufacture of Iron and Steel," in which he proposes to use a hydraulic press as a means of condensing the ingot whilst in a semi-fluid state, and for which purpose he states a strong slide or cover must be made to close the mouth of the mould during the process.

The plan adopted by Sir Joseph Whitworth has been for some time in successful operation, and the process of hydraulic compression has also been practiced at the works of Messrs. Revellier, Bietrix & Co., France, and at the Neuberg Works in Austria.

Mr. R. N. Daelen, of Barop, has a plan for pumping the fluid steel into a closed ingot mould. The three last systems are fully illustrated and described in the pages of *Engineering*, August 6, 1875, and October 8, of the same year, and are probably well known to the members of this Institute.

The system which the author proposes to describe is the invention of Mr. H. R. Jones, of the Edgar Thomson Steel Company, U. S. A., and is now in constant operation at the works of that company near Pittsburg.

The process is a very inexpensive one, and consists in simply admitting steam at a high pressure to the top of the ingot mould immediately after the metal has been poured.

A steam drum or receiver, communicating direct with the boiler, is fixed, for the sake of convenience, to the side of the ingot crane. This drum has a number of cocks corresponding with the number of the moulds. India-rubber pipes are provided to conduct the steam, one end of the tube being permanently fixed to the drum, and the other by means of a coupling attached to the lid of the mould.

The base-plates upon which the stools rest are secured to a good foundation, and the stools are accurately fixed in position on the arc of a circle having the post of the ladle crane as a center. This is done to avoid racking in and out the ladle when pouring. The stools have projecting ribs to fit the base plates, and heavy lugs to which the moulds are clamped.

The ingot mould has at the upper end a cone seat accurately turned, upon which the pouring cup rests, and which afterwards receives the lid, which is secured in position by means of a steel wedge.

By this arrangement the cup is easily removed and the lid (with coupling and flexible pipe attached) substituted; the cone seat forming a steam-tight joint.

In coupling up the steam pipe, a shorter time is occupied than by the old method of filling up with sand.

For generating steam a cylindrical boiler is used 30 in. in diameter by 20 ft. long, and constructed to carry a pressure of 250 lb. per square inch, although in practice a greater pressure than from 80 lb. to 150 lb. does not appear to be necessary, the higher pressure being used for mild steels.

The result obtained by the application of this process at the Edgar Thomson Works has proved completely successful.

Formerly at these works, with a 14 in. ingot reduced to a bloom of 7¼ in. + 7¼ in., it was necessary to cut off from 30 in. to 36 in. of the bloom in order to arrive at a part free from piping, whilst under this process the ingots are free from porosity, and are turned out with a perfectly level top.

A careful series of experiments has been made in order to ascertain the difference between an ingot cast in the ordinary way and one under steam pressure; and it has been found that the latter, with the same quantity of metal from the ladle, is from 1½ in. to 2 in. shorter than the former when cold.

In the year 1878, when this process was first adopted, a saving of 2.6 per cent. was effected over the proceeding when the old method was in use; that is to say, what in the year 1877 was scrap, in the year 1878 was sound steel.

In addition to the consolidation of the ingot, there are several other advantages in this system. It is found that the steam, acting upon the end, cools and hermetically seals the top of the ingot, and enables the men to deal with it ten minutes earlier, without any fear of bleeding; and this allows the ingot to be conveyed to the reheating furnace with greater rapidity and in a hotter condition than formerly.

It is also found that with the use of steam the ingot moulds last better, the average in 1879 being 95 ingots, or nearly 112 tons of steel per mould.

In a paper read by Sir Joseph Whitworth, at the meeting of the Mechanical Engineers, in Manchester, July, 1875, several theories were discussed as to the effect of compression on fluid steel, and although the result was generally admitted to be satisfactory, the subject was dismissed before any solution had been arrived at as to the *modus operandi*. During the discussion several speakers were of opinion that the gases were not forced out, but merely compressed, and consequently occupied so small a space that they could not afterward be detected.

Mr. Daniel Adamson considered that the soundness of the compressed ingots could be accounted for in the following manner: That the metal running into the mould necessarily became cooled and solidified on its outer surface first, and that the natural contraction of the interior afterwards becoming cool must leave vacuous pores if allowed to cool in the ordinary way; but that the compression taking place during the time that the outer surface was becoming solidified, the metal was welded together particle for particle, and the vacuous spaces avoided.

Sir Joseph Whitworth did not offer any explanation in regard to the expulsion of the gases under his system of compression, and it would be interesting to know the views he entertains on the subject.

Dr. Siemens observed that the result might be accounted for by the circumstance that the fluid steel, congealing first on the outside of the mould, offered more resistance there to the motion of the plunger, and the outside becoming thus, comparatively speaking, porous while the fluid portion in the center received a larger amount of compression than the outside, which had more power of resisting the pressure. The particles of gas entangled within the fluid mass would therefore encounter rather less resistance toward the outside than toward the inside, the full hydraulic pressure being transmitted to the center of the fluid mass, and in that way the expulsion of the gases from the fluid metal might perhaps be accounted for.

The following explanation from Mr. F. Moro, chief engineer of the Kladno Steel Works, Austria, in reference to the consolidation of ingots compressed under the steam process, appeared in a recent number of a scientific journal:

"The liquid steel has, like other metals, a *g.*, lead, the peculiarity of absorbing gases, and the more of them the higher the temperature. On the other hand, these absorbed gases will come out of solution on cooling, accumulating in bubbles until the rigidity of the setting steel puts an end to this. This will be the case under ordinary atmospheric pressure, but it is otherwise when liquid steel is submitted to the influence of high pressure; then the absorbed gases remain in solution, like carbonic acid in well bottled soda water, for example, and any formation of bubbles will become impossible at a pressure of over six atmospheres."

The method of steam compression described in this paper has recently been adopted at the works of Messrs. Bolckow, Vaughan & Co., and although permanent arrangements have not yet been completed, sufficient has been accomplished to confirm the statements of our transatlantic friends, and to justify the expectation that under this simple and inexpensive process, a result is gained equal to that obtained by the costly and elaborate systems of compression hitherto practiced.

LEAD FUME, WITH A DESCRIPTION OF A NEW PROCESS OF FUME CONDENSING.*

By A. FRENCH.

THIS paper describes a series of experiments made by the author and Messrs. H. J. Wilson and J. Wycliffe Wilson, of the Sheffield Smelting Company, with a view to discover a good process for condensing fumes of lead, silver, and other metals which volatilize in the smelting and refining operations. The loss of lead and frequently of silver by sublimation is an evil with which every smelter is familiar; not only does the loss amount to hundreds of tons of lead in a year at many works, but the injury which is done to health and vegetation is very great. It also describes a new and very successful method of condensing, whereby from 95 to 98 per cent. of the metallic contents of the smoke is saved.

The various methods of condensing fumes which have been tried in this and other countries may be classed as follows:

- (a.) Deposition of the fume by its own gravity in long flues, with or without the addition of a series of settling chambers, placed either near to or at some distance from the furnace.
- (b.) Filtering through flues, towers, or chambers containing brushwood, coke, coarsely woven fabric, or similar porous material, using water either in a constant or intermittent stream to keep the filters from becoming choked.

* Read before the British Association for the Advancement of Science (Section B), Sheffield, 1879.

* Paper read before the Iron and Steel Institute, at Liverpool.