Entered as second-class matter at the New York, N.Y., Post Office, April 14th, 1899.

SOLE American Agents } SPON & CHAMBERLAIN, 123, Liberty Street, NEW YORK. { Single Copies, 8cts. Annual Subs, $3. } Post Paid

THE MODEL ENGINEER & ELECTRICIAN

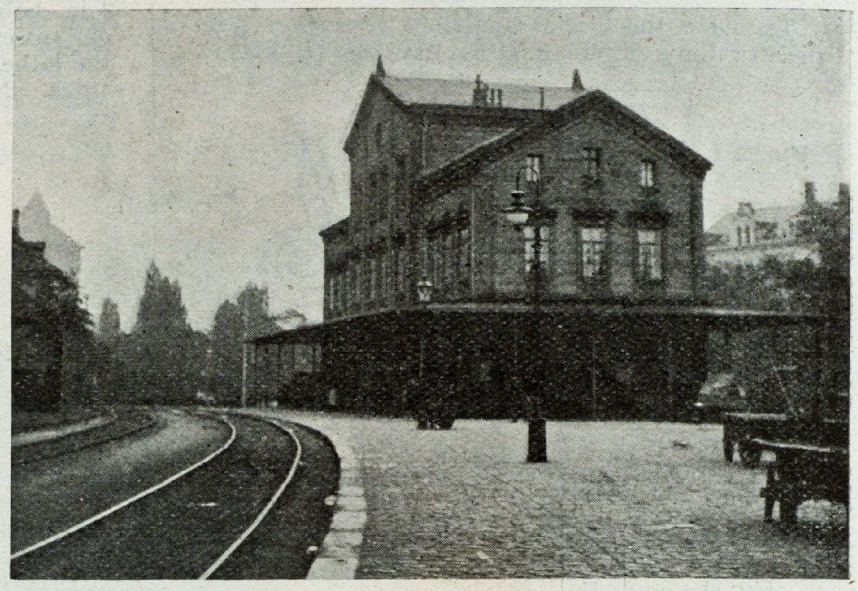
VOL. XVI. No. 306. THURSDAY, MARCH 7, 1907. PRICE 2d. (Post Free, 3d.)

A Model Engineers' Tramp Abroad.

(*Continued from page* 197.)

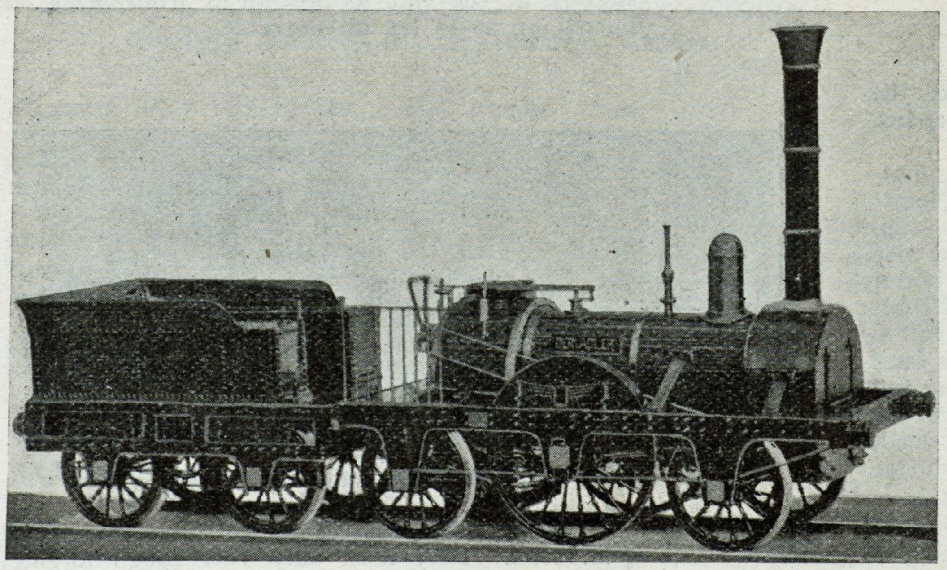
THE RailwayMuseum at Nuremberg, which we referred to last week, contains,in addition to the models of locomotives and rolling-stock, examples of broken axles, rails, tyres, etc., with their respective histories, and also the remains of several exploded locomotive boilers which have from time to time failed. To show the bad effects of scale, an actual boiler, which was fitted to a passenger train locomotive, built in 1852, and which ran until 1879, is exhibited, cut in half longitudinally, exposing all the tubes and water spaces of the firebox.

For those desirous of more particularised information, the Museum contains full working drawings of the railway machinery and appliances used by the Bavarian State Administration. If you want to consult the drawings of, say, a certain type of railway truck or passenger carriage, you simply indicate to the obliging attendant which of the many portfolios lying on the table in the Museum you require and he unlocks them. You then proceed to take your notes.



THE FIRST RAILWAY IN GERMANY: A VIEW OF THE NUREMBERG STATION OF THE NUREMBERG-FUERTH RAILWAY.

In our last article we just mentioned that the Museum contained a model of the first locomotive used in Bavaria (also the first in Germany). This engine, the records say, was purchased from Messrs. Stephenson & Ericsson* in 1835. As will be seen by the picture herewith, the locomotive is of Stephenson's standard "Patentee" class, as introduced on the Liverpool and Manchester Railway in January, 1834.† The engine was brought over by boat to Cologne—in pieces—and from Cologne to Nuremberg by road. It was re-erected in Späths workshops at Dutzendteich, and was put into service in December, 1835. The total cost of purchase was 28,880 marks, or £1,444, a fairly heavy sum for such a small engine. The engine had driving wheel, without flanges, as was common in those days, measuring 1·35 metres (4·428 feet) diameter The steam pressure amounted to 3·5 kg. per sq. cm. The valve gear was of the loose eccentric type, with hand gear attachment, the eccentrics being freed during the operation of reversing by a foot lever. To start the engine in the opposite direction, the engine driver used the hand levers to move the valves, until the engine was under weigh, when the driver put the eccentrics into engagement with the backward or forward stud on the crank axle, according to the direction of motion then being pursued.



A MODEL OF THE FIRST LOCOMOTIVE IN GERMANY: THE "ADLER" ("EAGLE"), NUREMBERG-FUERTH RAILWAY, 1835.

After a look at the railway carriage used by Prince Bismarck during the Franco-Prussian War, which, we may mention, is one of the "star" exhibits of the Museum, we journeyed across

* The writers are not aware of any partnership between Stephenson and his clever contemporary Ericsson. Possibly the latter obtained the order and placed the work in the hands of Messrs. Stephenson & Co. Ericsson was the builder (with Braithwaite) of the "Novelty," tried at Rainhill, L. & M. Rly., in 1829.

† See Stretton's "Development of the Locomotive." (Crosby, Lockwood & Co.)

to the other side of the town to view the railway upon which this first locomotive ran. Contrary to the usual rule, the pioneer railway in Germany, connecting the two towns of Nuremberg and Fuerth, remains, except for improvements in locomotive and carriage—which are not vast—in the same condition as it was seventy years ago. It has not been absorbed, like our Stockton and Darlington and Liverpool and Manchester railways, by the newer and larger systems, but still serves to connect the two towns parallel with the main line of railway and an electric tramway. The principal features of this railway were no doubt taken from the earlier examples in this country, as students of railway history will recognise from the photograph of Nuremberg station, which is reproduced herewith.

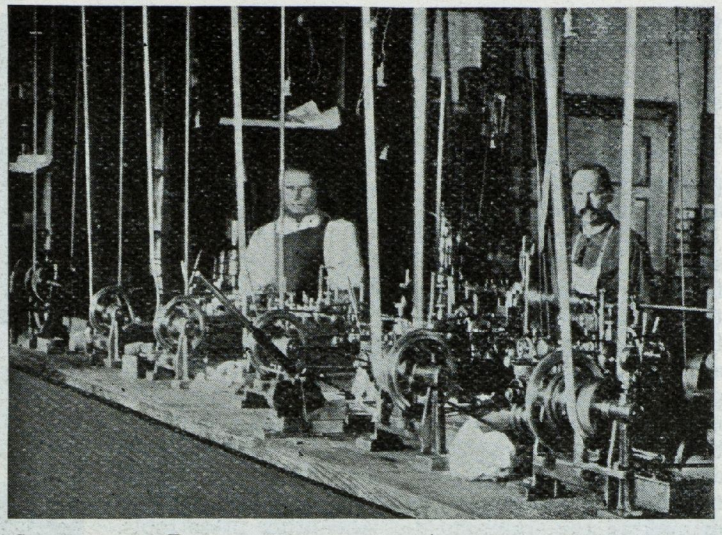
The next item of interest was a visit to one of the large toy factories with which both the towns of Nuremberg and Fuerth abound. A greater

THE PRINCIPAL AND HIS EXPERIMENTAL FOREMAN.

proportion of the work in making toys of the cheaper variety is perhaps done by home labour. The making up of toy pianos, wooden animals, and small metal toys in many cases occupies the time of a whole family, each member having his allotted portion, the raw material in the shape of the fret-cut, shaped, and turned parts, printed embellishments, and other portions, which are better made in quantity by repetition tools, being obtained from the factory, to which the toys are returned by the home-workers when completed.

All the better-class toys—steam engines and phonographs—however, are made entirely in well lighted, well ordered, and cleanly factories. Although Nuremberg turns out millions of toys per annum—we say millions, because of even a single "shilling line" of toy trains a manufacturer told us he put "in work" three or four thousand dozen in one season—there is no smoke and dirt hanging like a pall over the town.

In going through a toy factory one is struck by the care and forethought given to the production of any new kind of toy. The motor omnibus appears on the London streets—very soon afterwards in our toyshops we see splendid models of,

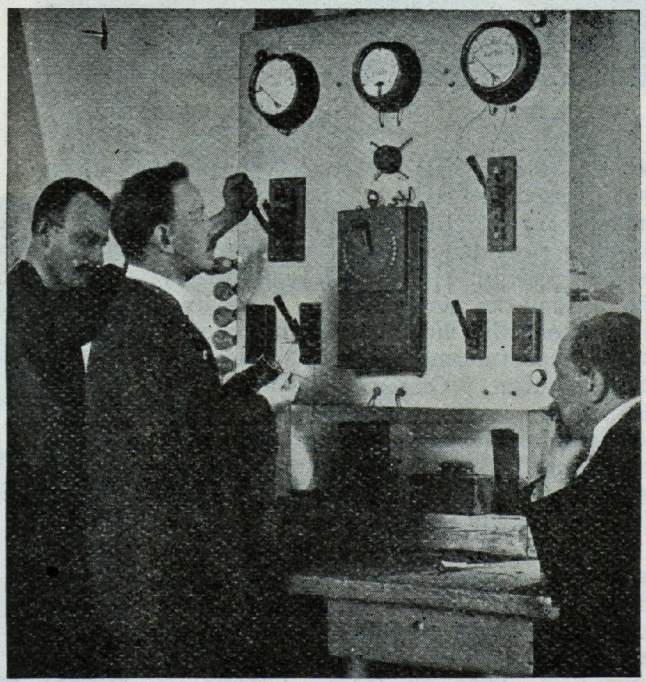


CLOCKWORK PINION MAKING BY AUTOMATIC MACHINERY.

say, a "Vanguard" or a "General" omnibus, correctly coloured, and replete with accurate representations of the advertisements used on these vehicles.

We were privileged during our inspection of the factory at Nuremberg to see how this is done, and were shown every stage in the production of the model—from the drawing office to the packing-room.

The serious item in the bringing out of a new toy is, of course, the press tools, the cost of which often runs into three figures. The first sample is painted and used as a means of getting orders for the model and as a help in the painting and building up of the finished model. All the best models are enamelled by hand, and very expert are the painters and liners employed on this work in plying the pencil and the brush. The models are, of course, dealt with in batches; the parts are pressed out in tinplate,



THE DRAUGHTSMAN TESTING A NEW MOTOR FOR CURRENT CONSUMPTION AT THE SPECIAL SWITCHBOARD PROVIDED FOR THIS WORK.

which, by the way, all comes from England (or Wales, rather), and then soldered, or with a sort of hook-and-eye attachment securely jointed together, by girls and boys, the men doing the more difficult portions of the work.

All steam models are tested by steam before painting and by compressed air after painting, and all the enamelled parts are properly stoved.

The accompanying series of photographs show some of the many processes in operation at the factory we visited. A photograph is given of one of the principals of the firm, who was at the time in conference with his experimental foreman, and showing an English visitor some of the new models then passing through the workshops where the first models are made up. We were then shown a batch of shapers in the toolroom. These machines are, as may be imagined, extensively used owing to the large number of flat surfaces to be shaped in making the stamping dies and other press tools. We next saw the stamps in operation. For the most part these are tended by women, as we show in our photograph. Some of the tools are self-feeding, as in the case of those for pressing discs

CASTING LEAD PARTS FOR TOY MODELS.

of tin for wheels, a revolving plate being used, so that the operator has only to lay the little discs of tin in the sinkings provided in this revolving plate as they pass by. For clockwork models, the automatic pinion-making machines were among the most interesting we saw in the departments devoted to this kind of mechanism. One girl attends to no less than six machines, a skilled mechanic being in charge of the shop and doing all the necessary work in setting up the tools, which the girl attendant could not do.

Many of the parts of the cheaper models are constructed of cast lead. The moulds for these castings are most beautifully made in gun-metal, and are held in the hand whilst the metal is poured in from a ladle. Groups of women perform this operation. They sit round a cauldron of molten metal, and monotonously turn out miniature

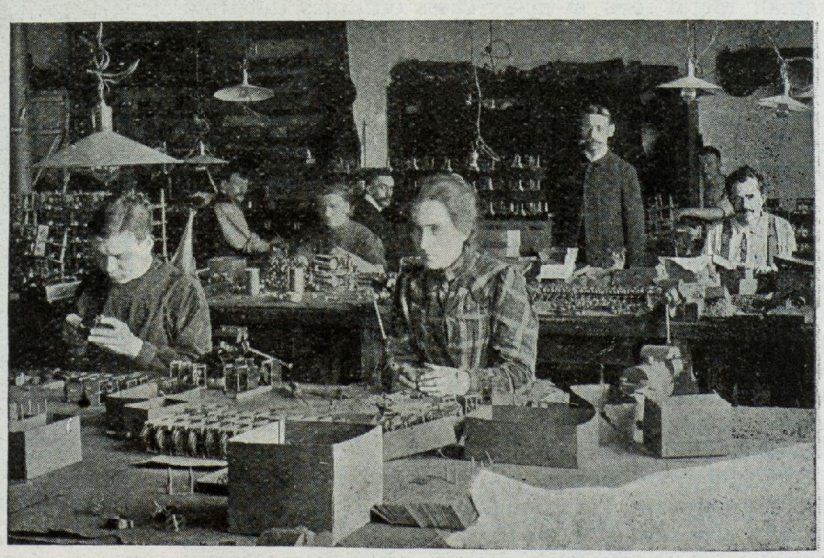
BUILDING UP PARTS OF MODEL STEAM ENGINES AND PHONOGRAPHS.

wheels, brackets, frames, safety valve weights, and other small but necessary items for mechanical toys and small model steam engines.

As mentioned already, the parts are erected by women, boys, and girls, who sit at long benches, each with a tray containing a batch of work before them. Here we see model steam engines being put together piece by piece, the building up of cheap phonographs by the thousand, and clockwork mechanisms in various stages of completeness.

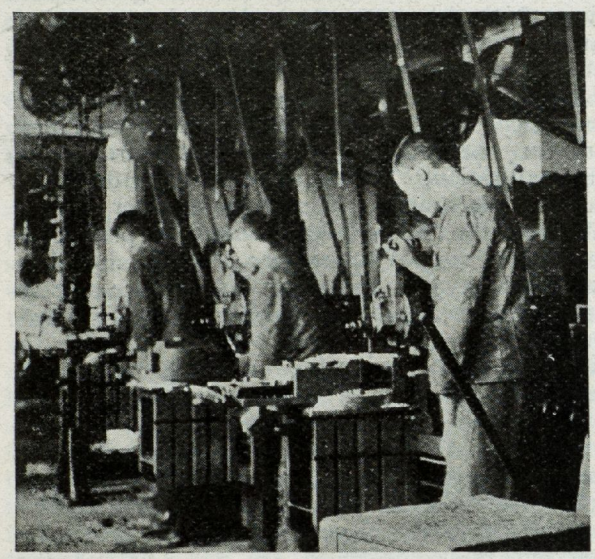
When finished, the steam engines are tested by steam from a little separate boiler, the operator making any adjustments in the valve setting to get each engine to run its best. So skilled is he that this operation is the work of a few minutes only, and then on comes the next model.

Except where the parts are separately painted—as, for instance, in the case of phonograph frames,



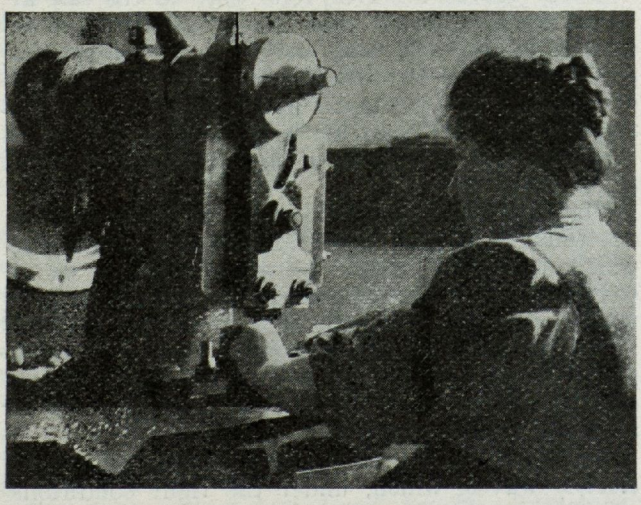
MAKING UP THE CLOCKWORK PARTS FOR VARIOUS KINDS OF MECHANICAL TOYS.

which are hung on a nail and painted by an air-spray brush—after erection the models are painted and stoved, and to ensure that during the latter process no paint or solder has blocked up any of the steam ports or passages, another operator makes a final test by means of compressed air at a high pressure. Whilst he is doing this, he blows on the cylinders of the engine with a jet of flame from a gas blowpipe, and in this way nullifies the severe cooling effect of the expanding air, which would freeze the oil on the cylinder and otherwise lead to false results being obtained.



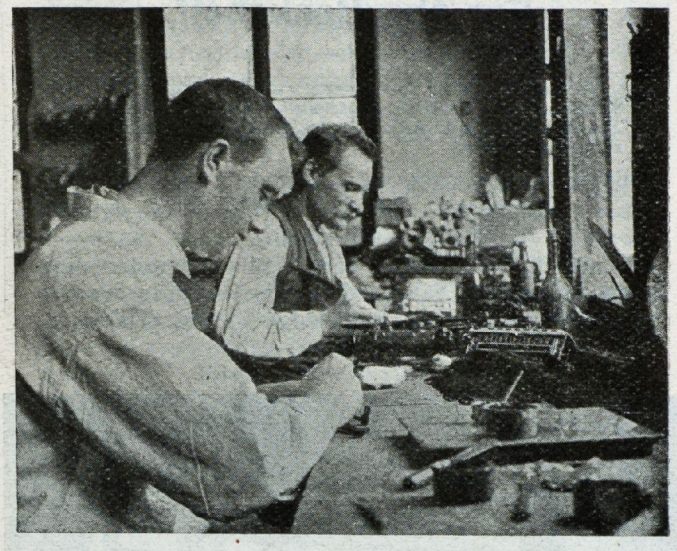
A Batch of Shapers in a Toy Factory Tool Room.

Although we are not including any pictures of the rooms devoted to the boxing and despatch of goods, we may say that much care is given to this department. By the neat and efficient packing of goods not only a deal of damage is saved, but the customer is doubly pleased—however



A Stamping Press at Work.

much the lady of the house may rail at the shavings and similar litter which may smother the dining-room—when at Christmas time he safely receives



The Painters and Liners at Work.

his model or toy nicely ensconced in proper packing material.

We might have said more about the toy industry of Nuremberg and the district, but the magnitude of the business, its many phases, and the lack of

Testing Model Steam Engines by Steam from a separate Boiler.

available space forbids. Nuremberg, which at one and the same time represents mediæval splendour and modern commercial activity, was the last place in Germany we had planned to visit. We returned northwards with only one other object in view, and that, a visit to The Hague to note the progress our amateur compeers in Holland are making in the art of model-making; and to more particularly deal with the work of the Dutch Society and its vice-president, Mr. J. A. van Hoogenhouck Tulleken.

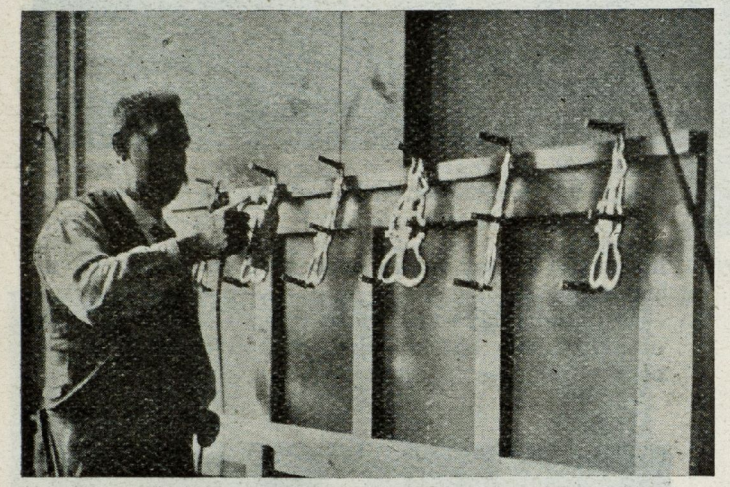
(To be concluded.)

For the Bookshelf.

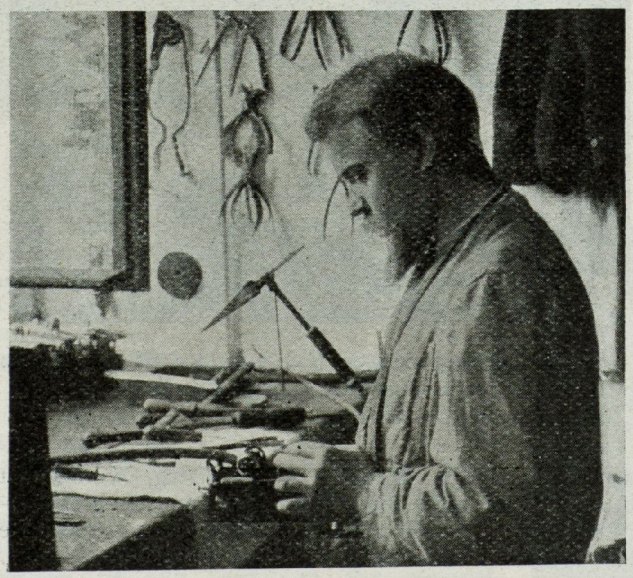
Any book reviewed under this heading may be obtained from THE MODEL ENGINEER *Book Department, 26–29, Poppin's Court, Fleet Street, London, E.C. by remitting the published price and the cost of postage.*]

ELECTRICAL IGNITION FOR MOTOR VEHICLES. By W. Hibbert. London: Whittaker & Co. Price 1s. 6d. net; postage 2d.

This little book will be very helpful to motor men preparing for the City and Guilds Institute examinations who have no knowledge of the principles upon which the successful working of the apparatus under their charge depends. Actual questions that have been set in the past are dealt with. The chapters include information on Batteries, Coils, Commutator, Multi-cylinder Engine Wiring, Magneto Methods of Ignition and Faults. The diagrams and illustrations are very clear and to the point, but many of the reference letters could with advantage have been a little larger.



PAINTING CHEAP PHONOGRAPH FRAMES IN BATCHES BY MEANS OF AN AIR SPRAY "PISTOL" BRUSH.



TESTING A MODEL STEAM LOCOMOTIVE BY COMPRESSED AIR.

The Poulsen System of Generating Electric Waves for Radio-telegraphy.

By R. P. H.-G.

READERS interested in this new system of wireless telegraphy will no doubt welcome the following particulars of Mr. Poulsen's recent lecture in London on this epoch-making invention and its possibilities. Hitherto the only known methods of producing alternating currents of very high frequency have been by means of rotatory or reciprocatory dynamos or by the sudden discharge of condensers through inductive circuits. The first-named method gives an unbroken series of undamped oscillations which differ from ordinary alternating currents only in the excessive frequency of their vibration. By means of specially designed high-speed alternators, with a large number of very small poles, Mr. Tesla has succeeded in producing currents at 25,000 cycles per second, and has shown the greatly increased importance which induction and capacity assume at very high frequencies.

When a conducting body is raised to a high potential so that lines of electric strain are formed in the insulating medium between it and another conducting body, the "electrical displacement" causes a storage of energy; if a conducting path be provided between the two bodies, this energy returns itself in the form of a rush of electricity which eventually equalises the potential of the system.

If the conducting path be such that a current flowing through it produces a magnetic field, and if the discharge takes place suddenly across a spark-gap which interrupts the circuit, the rush is oscillatory, provided that the resistance of the circuit is not too high.

The frequency of the vibratory currents thus produced depends upon the capacity and self-induction in the circuit, and in practice varies from about 100,000 to about 30,000,000,000 of complete oscillations per second.

These figures, however, refer only to the *rate* at which the oscillations take place, and it must be clearly understood that each spark produces a group of vibrations lasting only a few thousandths of a second, and gradually dying away so that the amplitude of the vibration is greatest at the commencement of the discharge and decreases to zero at the end.

The rate at which the oscillations decrease is determined by the rate of dissipation of energy, which, though dependent on more than one set of conditions, may for this purpose be considered as a whole, and is known as the *damping* of the system.

The two most important factors which determine the value of the damping are the resistance of the circuit and the rate at which it is capable of radiating energy in the form of waves.

The production, properties, and detection of electric waves, which, under the right conditions are generated by oscillatory discharges, has for long been the study of numbers of scientists, whose attention has been directed largely to their use for the purposes of wireless telegraphy.

It has long been realised that if some practical method of producing waves in a continuous stream