

proportions, having increased in that year to £10,845,422 as compared with £6,684,276 in 1852, £5,830,370 in 1851, &c. The value of the machinery exported last year was never exceeded in any previous twelve months, steam engines having figured for £1,243,467, and other kinds of mechanical apparatus for £2,976,221; while in 1860 the totals were £1,238,333 and £2,599,488 respectively. In 1850 the value of the steam engines exported was only £423,977, and of the general machinery £618,189; so that during the last ten or eleven years a vast development has taken place in the demand for British machinery in foreign countries and in the colonies.

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*An Improved Mode of and Apparatus for Transmitting Despatches and Small Articles, by the agency of Electricity.* Patented by HENRY COOK, of Manchester.—Dated 8th January, 1862.

From Newton's London Journal of Arts, September, 1862.

This invention relates to a novel method of transmitting written or printed despatches, letters, or other small articles, by electricity. The telegram, despatch, or information to be transmitted, is written or printed on paper, placed in a carriage, which runs along a line of railway, laid in a tube or pipe formed of a series of hollow electric coils or electro-magnets. The carriage is propelled by the agency of magnetic electricity, which is induced in the hollow coils by a traveling battery mounted on the carriage. It is well known that a bobbin, surrounded with coils of insulated iron or copper wire, has the power, when the above-mentioned wire has a current of electricity passed through it, of attracting into its interior a bar of iron of the length of the bobbin. Upon this principle the electric propeller for transporting despatches, letters, and other small articles, is constructed.

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*On the Chemistry of Digestion.* By DR. MARCET.

From the Lond. Chemical News, No. 134.

Until very recently but little attention had been bestowed by chemists on those changes which go on under the influence of organic life, and, in consequence, many vague speculations had been entertained and published concerning this most interesting department of science; of late years, however, many able investigators had taken the subject in hand, and much progress had already been made. Many obstacles attended these inquiries on account of the difficulty of observing the conditions of the immediate principles during life; the term "immediate principles" being applied to those substances produced by organic life from which no less complex body could be obtained without a complete destruction of the substance in question. As an example of the power possessed by organic substances of preventing ordinary chemical reactions, the influence of albumen or the serum of blood on lactate of iron was shown. A mixture of this salt with white of egg gave no color with ferrocyanide of potassium, although the lactate itself furnished the ordinary blue precipitate. With respect more es-

pecially to the chemistry of digestion, it appeared that after a long fast the contents of the stomach were alkaline, and very small in quantity; as soon, however, as food was introduced, the gastric juice was secreted in quantity, and an acid reaction was perceptible. The object of the action of the gastric juice was, no doubt, to render the food capable of absorption; and accordingly it was found that albuminous, gelatinous, and other similar matters introduced into the stomach, became converted into a substance called "peptone," which, according to Lehmann, might be viewed as the same body, whatever nitrogenous food was employed; it had been shown, however, that the peptones resulting from the digestion of cartilage and the mucous membranes rotated the plane of polarization of light, whereas peptones from albumen had not this power. The gastric juice, which was at first abundant, gradually diminished in quantity and became more acid, probably in order that it might act on the less masticated or less easily digestible portions of the food. Besides the conversion of the albuminous matter into peptone, another important change took place in the stomach, namely, the decomposition of the neutral fats and setting free of the fatty acids; this was an important decomposition, for the bile would form an emulsion with a fatty acid, but not with a neutral fat; some of the fat sometimes escaped decomposition, but the pancreatic secretion formed an emulsion with this portion. The formation of an emulsion seemed to depend on the incrustation of each globule with a layer of soap, which prevented the globules from coalescing, and increased their specific gravity, so that they remained for a long time suspended in the liquid. Dr. Marcet considered that in experiments on digestion it was always better to employ gastric juice obtained directly from the stomach of an animal, instead of an artificial compound, such as was employed by some physiologists. There was some dispute as to the nature of the free acid existing in the gastric juice,—some supposed it consisted of hydrochloric acid, while others imagined that other free acids, especially lactic acids, were present; since quantitative determinations of the amount of hydrochloric acid and of the bases present in the gastric juice showed that there was more hydrochloric acid than was sufficient to combine with all the base, it was evident that there must be some free hydrochloric acid present; it was highly probable, however, that other acids were present in a free state, for on placing some gastric juice in a dialyzer and leaving it until all the hydrochloric acid had passed away, the remaining matter was found to be still acid. It had been supposed that the soda introduced in the shape of common salt with the hydrochloric acid of the gastric juice, was employed in the formation of bile; but it appeared from the interesting researches of Dr. Bence Jones that this was not exactly the case, for healthy blood was always alkaline, but appeared to have an incessant tendency to become acid; the acid was, however, as rapidly removed by the secreting organs; and it had been found that when the secretion of gastric juice was active the urine became less acid, and it gradually increased in acidity as the gastric secretion was moderated, so that the two actions balanced one another.

It appeared that if no salt were supplied with the food eaten, the hydrochloric acid secreted was totally absorbed again with the food, furnishing an example of that wonderful power of adaptation to circumstances which enabled animal life to continue under varying external conditions. The only materials of the food that passed through the stomach and intestines undigested were such substances as hair, horns, &c.; together with these, however, a small quantity of excrementitious matter, obtained from the various secretions poured into the intestines, was always present, and a crystalline matter of definite chemical composition, and bearing some analogy to cholesterine, might be extracted from it.

*Lecture before the Royal Institution of Great Britain, on Coal.*

By WARRINGTON W. SMYTH, Esq., F. R. S.

From Newton's London Journal, September, 1862.

The speaker commenced by proposing to select one portion only of a very large subject; and, neglecting chemical and statistical and mining particulars with reference to this important mineral, to confine himself to the physical conditions under which it is found to occur. The enormous value of the coal of this country might be understood from the simple facts that nearly 300,000 of our fellow-subjects find their employment in the coal-mines: and that the total quantity raised in 1860 amounted to no less than eighty-four millions of tons.

Mr. Smyth then proceeded to describe the nature of the various substances with which the coal is associated, referring to specimens on the table from the field of South Yorkshire. Comparison was made between the total thickness of carboniferous rocks or coal measures of different districts, as well as between the total thickness of coal (in the aggregate of the seams); and hence, it was shown, we have one reason for not estimating the value of a coal-field merely by its area, as we find it laid down in a geological map. Thus, the well-known Durham field, with a thickness of measures of about 2000 feet, has a total thickness of coal of 50 feet. The Derbyshire, 2000, and almost twice the thickness of coal; the North Staffordshire, 6000 feet of measures, and 130 of coal; whilst the South Welsh and Saarbrücken fields exhibit thicknesses of 12,000 to 15,000 feet, with a proportionate increase especially in the latter) of coal.

A second reason for mistrusting area as a criterion of the importance of a coal district, is the various forms into which the coal measures have been thrown or moulded by agencies operating at a later date in the earth's crust, whence some districts may exhibit by outcrops an indication of the full amount of their entire contents, whilst in others the beds pass with a gradual inclination beneath newer formations, through which they may nevertheless be accessible. As instances of this were quoted the vast accession of mineral wealth added, even in the last twelve years, to the Westphalian coal-field, by the explorations carried out through the covering of cretaceous rocks which clothe the northern side of the coal-field, and the remarkable