

I. Homogeneous reaction—

	Small	Large
Length in direction of flow	L	$Ln^{\frac{2-m}{2+m}}$
Diameter	D	$Dn^{\frac{m}{2+m}}$
Fluid velocity	v	$vn^{\frac{2-m}{2+m}}$

II. Heterogeneous reaction—

Length in direction of flow	L	$Ln^{\frac{2}{2+2m}}$
Diameter	D	$Dn^{\frac{m}{2+2m}}$
Fluid velocity	v	$vn^{\frac{2}{2+2m}}$

It is found that $m \sim 0.8$, for turbulent flow, and $m \sim 0$, for laminar flow. Thus when $n = 10$, that is for a tenfold increase in production, the cylindrical reaction vessel must be 3.3 times longer and its diameter only 1.7 times more. The reaction vessel is thus geometrically distorted.

R. Edgeworth-Johnstone has more recently taken the subject up a little further [*Trans. Inst. Chem. Eng. (England)*, 1939, p. 129] by introducing simpler dimensionless factors derived from the rate of reaction formula and the Arrhenius equation relating to reaction velocity with temperature. For homogeneous chemical reactions of any order n , two dimensionless factors can be used

$(X_n \cdot a_2 \dots a_3 \dots a_n \cdot t)$ and E/RT , where X_n is the constant in the Arrhenius equation $K_n = X_n \cdot e^{E/RT}$, a_n is the stoichiometric concentration, and the other symbols have the usual significance. For heterogeneous chemical reactions, the extent of interfacial areas must also be taken into consideration. On the basis of the above similarity principles Edgeworth-Johnstone has shown that if two reaction vessels have volumes V and $n^3 V$, i.e., are related by scale factor n , then for a chemical reaction taking place at the same temperature and with the same initial concentrations, the volume rates of flow should be Qn^3 for the homogeneous reaction, Qn^2 for a heterogeneous system filled with geometrically similar catalyst grains, but Qn^3 for a heterogeneous system filled with catalyst grains of identical size in both systems.

The theoretical considerations outlined above regarding the application of similarity theory in chemical plant design constitute an important development of considerable significance in Chemical Engineering. Their practical utility is at present somewhat limited, but to a large extent they serve to visualise and to understand the nature of the difficulties in the designing of large-scale equipments on the basis of pilot plant work.

CENTENARIES

Lukin, Lionel (1742-1834)

LIONEL LUKIN, British inventor of life-boats, was born at Dumow 18 May, 1742. He became a member of the Coachmakers' Company in 1767 and continued in that business till 1824. He was a personal favourite of George IV and of Windham, the Secretary of State for War. He was also full of fertile mechanical gifts.

The first life-boat was conceived by Lukin in 1785. His pamphlet on this invention was published in 1790. Despite the patronage of the king, public apathy in regard to shipwreck stood in the way of Lukin getting his due recognition during his life-time.

Lukin secured buoyancy by means of a projecting gunevale of cork and air-chambers inside. He secured stability by a false iron keel. Lukin also invented a raft for rescuing persons from under ice, a rain gauge and an adjustable reclining bed for patients.

Lukin died at Hythe, Kent, in his ninety-first year, 13 February, 1834.

Seaward, Samuel (1800-1842)

SAMUEL SEAWARD, a British Engineer, was, with his brother John, the joint-owner of the Canal Iron Works which specialised in marine engines. The brothers supplied machinery to all parts of the world. They were pioneers in the construction of engines which provided speed without loss of comfort. The double-slide valve both for the steam and the exhaust, which they invented, resulted in a great saving in the consumption of fuel. This led to the adoption of their engines by the vessels of the East India Company and of several navigation agencies. They also advocated the use of auxiliary steam power for the voyage to India.

Samuel Seaward died in London 11 May, 1842.

Lofting, John (1659-1742)

JOHN LOFTING, a Dutch inventor, was born in 1659. He set up practice in London in 1688 as a merchant and manufacturer of fire-

engines. Before coming to London he spent seven years at Amsterdam with one of the masters of fire-engines. He applied his engines to some of the royal palaces, and private houses. But as he was not properly compensated, he was obliged to discontinue his efforts. By the end of 1690 Lofting seems to have been engaged in the manufacture of fire-engines on a considerable scale. For in November of that year, he presented a petition to the king saying that "iron-ware being absolutely necessary for the making of your petitioner's engines for extinguishing of fire, and your petitioner

being a Dutchman borne and ignorant of the laws of this nation, did import from Holland lately a small parcel of wire". This valued at £67-18-0 had been seized by the officers of the customs. This petition brought him the desired relief.

Lofting became bankrupt in 1700 and settled at Great Marlow. He died 16 June, 1742.

S. R. RANGANATHAN.

Madras University Library,
Coimbatore,
June 4, 1942.

SCIENCE NOTES AND NEWS

Depolarisation of Light Scattered by Sols.—Hoover, Putnam and Witenberg (*J. Phys. Chem.*, 1942, 46, 81) have reported careful measurements of the depolarisation factors of the light scattered by monodispersions of bentonite and ferric oxide. The reciprocity theorem of Krishnan is found to hold accurately. The measurements can be taken advantage of for a rapid estimation of particle size of bentonite. The depolarisation values are found to be independent of concentration, if the concentration of the colloid is less than 0.1 per cent.
K. S. G. D.

Viscometry.—Mr. T. Tirunarayanachar has described, in the *Indian Journal of Physics*, 1941, 15, 418) a convenient and improved type of the logarithmic decrement method for comparing the viscosities of highly viscous liquids. The vibration curves of a suitably mounted oscillating sphere are recorded by a simple photographic device, and from the measurements on the records, the damping coefficients can be estimated and compared. The method is demonstrated to be convenient and quick.

Anthelmintic Action of Phenothiazine.—Lapage (*Ind. J. Vet. Sci. & Animal Husbandry*, 1941, 11) has described in detail his experiments to assess the value of phenothiazine for the destruction of nematodes in sheep, goat, horse and pigs and the effect of the drug on the hosts. Given at the rate of 0.1 gm. per lb. of body weight to lambs and ewes, there was considerable fall in the egg count and by a comparative study it was elicited that this drug is far superior to either copper sulphate alone or copper sulphate and nicotine combined both in its anthelmintic and weight-increasing effects. Similar effect was observed in a goat which received a dose of 0.15 gm. of phenothiazine per lb. of body weight and in a horse which was given 0.1 gm. of phenothiazine powder per lb. of body weight.
S. D. A.

Babesia foliata n. sp. from a Sheep.—A new species of *Babesia* found in the erythrocytes of sheep in Mukteswar-Kumaun, U.P., India, and named *Babesia foliata* n. sp. on account of its flattened and leaf-like outline, has been described (Ray and Raghavachari, *Ind. J. Vet. Sci.*

& *Animal Husbandry*, 1941, 11). This species differs from the other two met in India, viz., *Babesia sergenti* encountered in the Imperial Veterinary Research Institute, Mukteswar (1932) and *Babesia motasi* in Mysore by Achar and Srikantiah (1934). Transmission experiments on sheep and goats showed that the disease was transmissible to sheep by intravenous injection of fresh infected blood but not to goats. The ticks involved are not mentioned in this article.
S. D. A.

Utilisation of Virginia Tobacco Seed.—Unlike the local varieties of tobacco in India which are all "topped" after some 12 to 16 leaves have developed and in that way prevented from flowering and setting seed Virginia tobacco is allowed to grow, flower and set seed, the reason being that a thin mild leaf is desired in the latter while in the former heavy and somewhat coarse and rank leaves are desired and the sap is all therefore directed into the leaves without any of it having to be used for flowers and seeds. There is at present some 1,25,000 acres of Virginia tobacco grown in the Guntur and adjoining districts of Madras, all of which is allowed to seed. As the seed required for sowing purposes is exceedingly small the quantity of surplus seed that is available is very large, estimated, in fact, at 8,000 tons per annum. Can these seeds be turned to any profitable use? The answer is furnished in certain studies by Swami Rao and Narasimham (*Ind. Jour. Agr. Sc.*, 12, Part II). These Virginia tobacco seeds are found to contain from 35 to 37 per cent. of an edible oil which is also a semi-drying oil. It therefore compares with ordinary gingelly oil as an edible oil and with linseed oil as a drying oil, although its drying properties are only partial unlike linseed oil. As against this drawback it is found that tobacco seed oil is quite colourless and does not develop a yellow tint in course of time in the white paints with which it may be mixed in the way that linseed oil does; so that, in these two respects it may be considered superior. The oilcake contains about 5½ per cent. of nitrogen and is a valuable cattle feed and can also be used as a manure. Neither cake nor oil has any nicotine in it and feeding trials with the cake as compared with groundnut oil