Correspondence.

Centrifugal Casting Process.

To the Editor of the Scientific American:

Plain cylinders, sections of pipe, or any straight tube form may be cast by this process, without using cores and with proper attention to keeping everything true, level, and well balanced; and by close skimming or tapping instead of pouring, the melted metal will produce castings which for many purposes will not require to be bored out. The flask will be a hollow metal drum, divided lengthwise into two halves, and provided with hollow trunnion bearings at each end, to one of which will be attached a driving pulley. The outside form of the cylinder or pipe to be cast will be moulded in the usual manner in this flask, the two halves bolted together, and the drum made to revolve with a speed somewhat greater than is necessary to overcome gravitation. The melted metal will be introduced through the hollow end bearings in amount proportioned to required thickness of the shell or walls of the casting, the end openings closed to keep out cold air—all while the drum is in motion—and regular rotation continued until the metal is sufficiently cold. The ends of the drum should be protected by a non-conductor of heat or externally heated a little, that the casting may not be distorted from the ends cooling more rapidly than the central portions. As a patent this is worthless, but as a useful process it will be of some value to the few who find use for it. An experiment is worth the trial by any one who has facilities for trying it—for, as yet, it is wholly unproved; but that it will work all right and come into use is the opinion of

W. L. DAVIS.

How to Set a Slide Valve.

To the Editor of the Scientific American:

I see in an old number of SCIENTIFIC AMERICAN, under heading "How to Set a Slide Valve," a long and tedious, though tolerably accurate, method of adjusting a slide valve described.

Since the crank, flywheel, main shaft, dead center, or connecting rod has nothing to do with the accurate setting of a slide valve, I will offer you the following very simple and quick method of performing that little piece of work to a nicety.

After having removed lid from steam chest, revolve the main shaft, or slack the set screws in eccentric, and revolve eccentric until full throw of same is made in one direction, opening the port to its largest size. Now make a nice, even-tapered wedge out of a lath and slip it down in open port, marking with a knife or sharp pencil the edge of wedge on valve seat. Now revolve eccentric until full throw is made toward opposite end of steam chest and until port is opened to its largest size, then slip the wedge down in port, as before, marking on valve seat as before; then with a carpenter's rule divide the distance between the two lines on edge of wedge, making a third line in the center. Then with eccentric at full throw lengthen or shorten the cam rod until wedge, with its center line, fits one port *neatly*, and it will fit the other one as neatly when full throw is made in opposite direction.

Now place your engine on a center, and revolve eccentric until the port over the end of cylinder in which the follower is placed has opened about one-sixteenth of an inch, and tighten your set screws. This done, your slide valve, also your eccentric, is properly adjusted, and no time wasted in hunting dead center or chalk marking flywheels, etc.

WILLIAM R. DUNN.

Alton, Ind., June 19, 1886.

The Edinburgh Exhibition.

The collection of exhibits sent from the Fairfield Shipyard and Engine Works is the most extensive and the most varied in this department of the exhibition. The interest attaching to most of the Fairfield exhibits is very great. It is probable that the most attractive object among them is the full model which is shown of the yacht Livadia, built a few years ago for the Emperor of Russia, and perhaps the most remarkable vessel ever launched.

In one of the Fairfield Company's cases there is shown a full model of the famous Alaska, whose performances as a Liverpool and New York liner in the Guion Company's service are notorious. As our readers are well aware, she has performed a number of very fast passages, one of them being done in six days eighteen hours. The model of the Alaska is really a beautiful piece of art workmanship. Close beside it there is an equally fine full model of the North German Lloyd's steamer Adler, one of the three sister ships now being completed at the Fairfield Works. All three vessels are fitted with all the most modern improvements, including triple expansion engines of 7,000 indicated horse power, and the Bryce-Douglas valve gear. The engines in question are the largest of the triple expansion type yet afloat, and the first that have yet been fitted into any of the New York passenger liners. We may mention incidentally that the valve gear of Mr. Bryce-Douglas is now exciting much attention among marine and locomotive engineers, especially in the northern part of the kingdom, and that it has been adopted in the locomotive engine which Messrs. Dubs & Co. have built for the Caledonian Railway Co., and which forms a conspicuous object in the central avenue of the exhibition. This engine we shall shortly illustrate. The same gear is also being adopted by Mr. D. Drummond in half a dozen locomotives which he is building for the same company, in their own works at St. Rollux, Glasgow. There are many other highly interesting exhibits at the Fairfield Company's stand (No. 786), which we cannot detail at length. Among them we notice photographs of six sets of engines, which were in course of construction at the Fairfield Engine Works in August, 1884, and comprising a total of nearly 40,000 indicated horse power. Another is a half model of the famous China tea clipper steamer Stirling Castle, which was built for Messrs. Thomas Skinner & Co., attained a speed on trial of 18½ knots per hour, and made the fastest passage on record with tea from China, doing the run from Woosung to the Isle of Wight in the unprecedented time of 29 days 11 hours. Of course, as Fairfield is famous for turning out some excellent examples of war ships for the British Government, the company's exhibits at this stand include at least two illustrations, more especially the twin screw armorclad Nelson and the vessels of the Comus class. We ought not to omit to refer to the half model of the twin screw barbette cruiser, which the Americans call the Destroyer, a vessel of 10,500 tons displacement, measuring 410 ft. by 64 ft. 3 in. by 38 ft. 6 in., and intended to have a speed of 21 knots per hour, her armament including two 110 ton guns and eight 6 in. long range guns.—*Engineering.*

The Delicacy of the Sense of Smell.

The sense of smell is probably the leading sensorial endowment in most insects, and it does for them what sight and hearing do for man. Its potency in helping along intelligence is very great, since we know that, mentally, insects stand at the head of the invertebrate, as man stands at the head of the vertebrate, world. The sense of smell is probably acute in some fishes, as, for example, the shark; this is the most active, if not the most intelligent, of fishes, and it has an olfactory mucous membrane which, if spread out, would cover some twelve square feet. The sense falls in value in the amphibia, reptiles, and birds, but rises again in the mammalia, though not in proportion to intelligence. Its extreme acuteness in the dog, the most intelligent of animals short of quadrumana, is well known. In man, the sense of smell is subordinate, and even rudimentary. Olfaction adds to man's enjoyment, preserves him from some dangers, but does not very much extend his knowledge of his environment.

Yet, despite the comparative insignificance of this sense in man, its delicacy is most marvelous, and by it we can appreciate more minute subdivisions of matter or the impact of more infinitesimal molecular vibrations than by any other of the avenues to the brain.

Professor Valentine has made some interesting and striking experiments in proof of this. He found that a current of air containing 1-30,000 milligramme of bromine, or 1-500,000 milligramme of sulphureted hydrogen, or 1-2,000,000 milligramme of oil of roses, could be perceived by the sense of smell. He also determined that the amount of odoriferous air which must pass over the olfactory membrane in order to excite the sense of smell was from fifty to one hundred cubic centimeters (one-tenth to one-fifth of a pint). He calculated, therefore, that the actual amount of bromine necessary to excite a sense of smell was 1-600 milligramme, of sulphureted hydrogen 1-5,000 milligramme, of oil of roses 1-20,000 milligramme (about 1-120,000 of a grain).

Two recent experimenters, E. Fischer and F. Pentzoldt, of Erlangen, have found two other substances which far exceed the foregoing in their capacity for affecting the olfactory nerves. These were mercaptan (sulphureted alcohol) and chlorphenol. They found that in air containing 1-230,000,000 milligramme to the cubic centimeter of chlorphenol, and 1-23,000,000,000 milligramme of mercaptan, these substances could be appreciated, and it was estimated that only 1-4,600,000 milligramme of chlorphenol, and 1-460,000,000 milligramme of mercaptan, is necessary to excite a sensation of smell. There exists, therefore, a substance which in so small a subdivision as 1-2,760,000,000 grain, or not quite one three-billionth of a grain, is capable of calling out a nerve impulse. This subdivision of matter is quite beyond comprehension, yet the nose alone can appreciate it. The smallest subdivision appreciable by the eye through the spectroscope is 1-1,400,000 milligramme of sodium, which is a two hundred and fifty times coarser division of matter than the minimum of odor-exciting mercaptan.

On account of the extraordinary power of mercaptan it is proposed to put it to some practical use in testing currents of air, ventilation, etc.—*Medical Record.*

On the Place of Origin of Uric Acid in the Animal Body.*

The endeavor of the author in this communication has been to show the place of origin of uric acid in the animal body, and to ascertain which of the two hypotheses on the subject is correct, viz., whether uric acid is first present in the blood, and then secreted from the blood by the kidneys, or whether it is formed by the kidneys themselves. To enable him to satisfactorily prosecute many of his observations, the author has devised a new method for discovering the presence of uric acid in very minute quantities of blood.

The results of his investigations are embodied in the form of the nine following propositions:

Prop. I.—Uric acid is secreted by the kidneys as ammonium urate; and in the case of birds and reptiles, whose urine is semi-solid, it is found in a definite physical form, more in the vitreous condition than in the truly crystalline shape.

Prop. II.—Uric acid, when present in the blood, is found under the form of sodium urate; and, when deposited from the blood during life in any tissue, it is also as sodium urate in its characteristic crystalline form.

Prop. III.—The daily quantity of uric acid in relation to their body weights secreted by different animals varies extremely. In some, as the carnivorous mammalia, the ratio may be less than 1 to 1,000,000, whereas in others, as birds, it may be as 1 to 85. In man it may be regarded as about 1 to 120,000.

Prop. IV.—The quantity of uric acid contained in the blood of different animals has little relation to that secreted by the kidneys. In birds, secreting daily so lar e a quantity, the blood is often found to be as free from uric acid as it is in animals whose daily elimination of uric acid is excessively small.

Prop. V.—When uric acid is absorbed from the alimentary canal, the blood becomes strongly impregnated, and, in fact, often almost saturated with it, so that its presence is readily discovered by any ordinary test.

Prop. VI.—One cause of the appearance of an unusual quantity of uric acid in the blood of birds in health is the presence of uric acid in the water they drink, and occasionally in their solid food.

Prop. VII.—When uric acid is taken into the stomach of man or other animals, the secretion of this principle from the kidneys is not increased, although at the time the blood may be rich in it.

Prop. VIII.—Uric acid is found in varying quantities in the blood obtained from different veins in the same animal. It is found in larger quantity in that from the efferent renal veins than in that from the portal afferent, or from the jugular veins; and the same test which freely exhibits uric acid in the blood from the former often fails to show it at all in that from the latter two.

Prop. IX.—The quantity of uric acid secreted daily by the kidneys of a bird is in close relation to the quantity of nitrogenized food taken during the time.

Having brought forward proofs to confirm these propositions severally, the author draws the following conclusions, viz., that every argument is in favor of the hypothesis that uric acid is formed by the kidney cells, in the form of ammonium urate, and that the traces of sodium urate found in the blood are the result of a necessary absorption, slight in amount, of the ammonium urate from the kidneys into the blood, and its subsequent conversion in that fluid into sodium urate.

Magnesia in Portland Cement.

For a long time, magnesia has been supposed to have a bad influence when present in cements, and M. Lechartier has been investigating the nature and cause of its action in structures built with cement, such as basins, dams, and retaining walls, either exposed to air or water. These structures were built by competent engineers in different localities. The cements used did not contain sulphate of lime in a harmful proportion, they had a proper density, and were made of good sands. Nevertheless, in all cases the effects were the same, and a slow destruction of the cement went on with time. The explanation of the facts arrived at by M. Lechartier is that the cements employed were really mixtures of Portland cement with magnesia, which behaved at first as an inert substance; but little by little the magnesia became hydrated, producing expansion of the mortar and the deterioration of the works. St. Clair Deville has shown that pure magnesia without admixture of silica and alumina can combine with water to form a hydrate of great hardness, but the formation is accompanied with increase of volume. Portland cement alone contains but a small proportion of magnesia. M. Lechartier further observes that the increase of volume of the mortars takes place more rapidly when the water gains access more readily to the mass. Hence the basins of fountains, reservoir walls, and so on, are affected in a comparatively short time.

* Abstract of a paper read before the Royal Society, June 10, 1886, by Alfred Baring Garrod, M.D., F.R.S., as reported in the *Chemical News.*