latest safety signals, interlocking and derailing devices, together with all necessary signals for both railroad and channel requirements. The working drawings and details were all worked out by the engineers of the Llewellyn Iron Works, and the fabricating of all the material and the erecting of same is being done by them.

All the parts were made at the local plant and brought to the ground, carefully numbered and marked, each for its exact place. The contract called for completion on December 1, but unavoidable delays have occurred, and extension of time has been allowed.

The piers of the old bridge have been used as false work. They will be taken out when the structure is finished. During the building the trains have used a temporary trestle.

At present the bridge merely crosses a dry or almost dry bed of sand. Sometimes there is water there, but very little. Inside there is water, and it is the intention to dredge it all out and make a harbour for Long Beach. For this end the Government has forced the railroad to build the drawbridge. Until the dredger is at work there will be little practical use for the draw. The site is about a quarter of a mile beyond the Pacific Electric's terminal at Seaside Park. The power for manning the huge crane that lifts the heavy girders and plates to their places is electric. The total cost of the bridge will be between £50,000 and £60,000.

Miscellaneous

On the Trend of Chemical Invention.

(By Robert Kennedy Duncan, Professor of Industrial Chemistry at the University of Kansas.)

One of the rarest and most valuable of the powers of man is "foresight," the ability to divine "the trend of things"—the trend of events, or, it may be, the trend of knowledge; its exercise, too, forms one of the most interesting and most agreeable of preoccupations. But the Patent Office is a place in whose activities one may determine this "trend of things" not by this rare power of divination, but just by the merest observation. There, there lie actually *in statu nascendi* to-morrow's ways and the implements of to-morrow's civilisation. It ought, therefore to be profitable to examine into the activities of this office during, let us say, the last year, in order to discover therein what is interesting and significant.

Now, the Commissioner of Patents may be likened to a wine merchant. He has in his office the wine of human progress of every kind and quality—wine, one may say, produced from the fermentation of the facts of the world through the yeast of human effort. Sometimes the yeast is "wild" and sometimes the "must" is poor, and while it all lies there shining with its due measure of the sparkle of divine effort, it is but occasionally that one finds a wine whose bouquet is the result of a pure culture on the true fruit of knowledge. But it is this true pure wine of discovery that is alone of lasting significance, and since it is for the most part to be found in those discoveries that are classed together as "chemical patents," I shall devote myself to them alone.

It is not the subject-matter of the patents that is of such interest; it is the fact that Fischer, the greatest living master-mind in organic chemistry; Ostwald, the giant amongst the physical chemists; Soddy who with Ramsay discovered the degradation of radium into helium—and many other men of this type and standing, should be patenting their discoveries. A few years ago the university professor who "degraded his science to utilitarian ends" became a pariah among his fellows, and to take out a patent was of all sins against the cloth, the one least forgivable. It was the duty of the man of science "to give his discoveries to the world." But things are now sweepingly different. Through the invasion of industry by science it has appeared that the scientific method is just as strictly applicable to useful as to "academic" knowledge; furthermore, it appears that the world is becoming increasingly convinced that ideas are *property*—just as truly property as homes and lands; and finally it appears that no man, however noble may be his desires, can "give his discoveries to the world." This last clause may not be obvious, but to see it one has only to reflect that a discovery can go to the people only through the industries, and that the industries inevitably place upon it all that the "trade will bear."

The necessity is laid upon the university professor of associating with the newly wealthy cultured class upon a self-respecting basis, and has led him to feel that with entire propriety he may patent his discoveries. Not only so, but the patenting of a discovery actually forwards it. This appears in a conversation which the writer recently had with Professor Lippman of Paris, the discoverer of the wonderful interference process of colour photography. Said Professor Lippman, "In order to forward the development of this process I refused to patent the fundamental idea." The result was that nobody would touch it. "If you wish to give such a discovery to the world, you should patent it." At any rate, whether it is to be deprecated or commended, the "trend" is there as an unmistakable fact, and every year we shall see an increasing number of patents taken out by the academicians of science.

First in obviousness among the patents are those which deal with the utilisation of waste. Thus with fuel: Through the gradual depletion of the fuel resources of the older countries and the conservation of our own through combinations of capital, the consequent rise in the price of fuel the world over has forced contemporary men to look for burnable material in what was the waste, of former days, in coal-dust. This coal dust is mixed with some binding material in order that it may appear as little briquettes of various shapes and sizes—mixed, it may be, with tar; plaster of paris and chromatised gelatin; cement and tar; or linseed meal, sulphur, flour, glucose, and lime. In certain cases substances are added to increase its combustibility—substances such as manganese dioxide or nitre. Not only coaldust, but turf also appears in many patents. In order to turn the turf into fuel it is dried and mixed superficially with resin for pressing, or, it may be, with naphthalene.

Artificial stone is the subject-matter of many a patent. For the most part it consists of cement mixed with asbestos, although, instead of this, sawdust and paraffin may be mixed with sand and a solution of magnesium chloride; or again, it may be made out of the mineral magnesite, mixed with zinc oxide and magnesium chloride, or silicic acid.

Many examples appear in foods. Thus with coffee: Many patents propose a coffee extract made for the most part by grinding the beans with volatile solvents and afterwards extracting the fatty and aromatic substances by water; others, again, are concerned with the removal of the noxious ingredients.

Proposals are made to pass superheated steam through tobacco with the object of removing the injurious nicotine, which is subsequently condensed and is good, we are informed through another patent, for tanning hides.

These are but trivial, though interesting, examples of a tendency which to-morrow will be an actual phase of our civilisation. Ever more and more our foods and indeed all the implements of our civilisation will be refined away of all unessential constituents and will be reduced to the pure active principles.

Attempts have been made in recent years to produce nitrogenous material out of the nitrogen of the air; it is the most unimaginative fact in the world that men must either solve this problem or starve. One promising, and, indeed, actually successful process for this purpose is that of Birkeland and Eyde of Norway, who on a large scale are now causing the nitrogen and oxygen of the air to combine under the influence of flaming electric arcs.

Another process for the fixation of nitrogen, which is to-day being used over Continental Europe and for which several factories are now being built in America, depends upon the production of calcium cyanide by pouring the nitrogen of the air over red-hot calcium carbide.

It is evident that the manufacturers of cyanide will also need to look to their laurels. Perhaps the most interesting patent in this connection is one based upon a wholly novel method of converting atmospheric nitrogen into the fixed and useful form through the metal calcium which is now obtainable at a comparatively cheap rate by the electrolysis of the fused chloride.

Still another patent interested in manufacturing products from air proceeds to make ammonia by passing the nitrogen from the air mixed with steam over hot turf. Altogether, we see that, in common with the initiators of all other processes and as typical of the course of invention, the original converters of atmospheric nitrogen are not unlikely to be drowned in the flood of new processes that take their origin from them—the invention dies, but *invention* lives.

Oftentimes it happens that a substance whose properties are supposably thoroughly understood assumes new properties through the application of a new process. Thus with graphite. Its utility through lead-pencils and stove-blacking suddenly, in recent patents, is supplemented by a supreme utility as a lubricant. Of course the fact that graphite has lubricating powers has been known and used for generations, but that it had a unique value in that respect it remained for Mr. E. G. Acheson to demonstrate through his process for the production of deflocculated graphite. The story of the way in which he was led to this discovery constitutes an interesting