so original, so imaginative, and one might even say so hypnotic in its power of suggestion over the senses. Specialism closes one's eyes and makes one dream. It makes the specialist among physicians see his special ailment in every disorder, and every disorder in his special ailment, and this so truly that merely to consult him is to fall his victim. Of course, he can never be wholly wrong, and his unwitting transgressions help discovery; but, nevertheless, his situation is full of humor. And in science generally, the specialist dreams, transgressing his own proper bounds without clearly knowing that he has transgressed."

The sciences, however, are extending into one another and interlocking in so many ways, Mr. Lloyd reminds us, that all specialism is becoming more formal than real. "The special science needs only to develop to become, and to find itself, universal. The barriers with which it surrounds itself gradually vanish into mere imaginary lines, which only long usage can possibly make seem substantial and opaque, so that specialism by a logic of its own or by the logic of a thought that conserves its universe even in the varied studies and conclusions of the many sciences, is destined to end in the unification of the sciences."

Science's third pitfall—positivism—is involved, says Mr. Lloyd, in both the others—objectivism and specialism. Positivism confines knowledge to actual experience. Its decomposition of the world into elements interferes with the volitional point of view of life. It is full of artificial "working hypotheses." The writer concedes that science must confine itself to experience and therefore must be positivistic—it has no choice. But the danger is that this will keep science and life apart, and this would be fatal to both.

This point of view—a condemnation of science for science's sake, and a plea for its intimate connection with our daily life—is the keynote of Mr. Lloyd's whole article and makes it noteworthy; for, as he has told us, most eminent scientific men have taken the opposite view. Mr. Lloyd's closing paragraph is as follows:

"Let us be blindly scientific, insisting on science being only for science's sake, recognizing nothing as worth while but great learning about a Greek particle or a minute insect or a mysterious element, and, like a dark cloud, there arises and spreads over our view the unknowable, and from this cloud a voice comes: 'Only the All is, and the All is One and the One is not for knowledge.' But as we apply our science, breaking through the walls of specialism, and liberating the will that was for the time their not unwilling prisoner, the sky clears. The one is not for knowledge, but for life; knowledge is not for knowledge, but for will, its natural fulfilment. 'The end of man is action, not thought, tho it were the noblest.'"

TANNING BY ELECTRICITY.

TANNING has been called the longest of industrial processes—that is, tanning by the old-fashioned method of steeping the hides. Inventors in the search for more expeditious methods have discovered various substitutes for tanning, but its use is still a commercial necessity, and it has been found that an electrolytic process of hastening the work is feasible. Great improvements have been made recently in this electric process, and an article in *The Electrochemist and Metallurgist* gives an interesting account of it. Says the writer:

"The slowness of the process of tanning is largely due to the difficulty with which the tannin penetrates into the hide. As the penetration progresses, the outer part of the hide becomes converted into leather and is thereby made impervious, consequently the rate of penetration decreases. Months of soaking in the tan pit are therefore necessary for thick hides. Many attempts have been made to hasten this absorption of tannin by hide. The methods used include circulating the tan liquor so that fresh portions are continually presented to the hide, forcing the liquid through the hide by pressure, and using strong aqueous extracts of tanning materials. It has been sought to attain the same object by passing a current of electricity through the vat in which the hides are suspended. One such process (Groth's) has been found to shorten the time of tanning to a quarter of that necessary when no current is used, and the leather is said to be unexceptionable. The apparatus devised by Groth is designed to hasten tanning by circulation of the tan liquor, as well as by the use of electricity. The tan liquor is contained in a tank in which is a frame carrying hides, and capable of being moved to and fro or rotated so as to bring the hide continuously into contact with fresh liquor. Copper electrodes are placed at the side of the tank. For a vat holding 1,500 gallons a current of not more than four amperes is used. . . . . .

"With this mild stimulus it was found that the rate of tanning was 16 times as fast as when the hides were simply immersed in the tan liquor and allowed to be stationary, and four times as fast as when the hides were moved and no current passed. Considering the well-authenticated test which has been made, it is noteworthy that tanners at large will have nothing to say to electric tanning."

AMERICAN LOCOMOTIVES AS FUEL-BURNERS.

THE discussion respecting the comparative merits of English and American locomotives still rages on the other side of the water, and is occasionally heard of here, altho American manufacturers seem not to be bothering themselves much about it. The chief indictment brought against the American locomotive is its excessive fuel consumption compared with the English-built machine. *Engineering* (London), however, warns English manufacturers that to attempt to meet American competition by decrying American goods is absurd. It says:

"In regard to the detail of fuel economy, we should not be at all surprised to find that British locomotives have a superiority. It is a question, however, whether we in this country have not made fuel economy a feature to which too much has been sacrificed. It is a detail of expenditure, doubtless an important one, but it is possible to overestimate its value. The American railway manager takes the view that a few dollars extra spent on coal is a profitable outlay, if it enables an engine to do more work, better time to be kept, and other economies to be secured in regard to capital expenditure, wages, etc."

Commenting on this, *Engineering News* (New York) says:

"It is probably true that the American locomotive, on the average, burns considerably more coal than its European competitor. Comparative tests, where they have been made, have generally shown this to be the case. The main reason for this, we believe, to be exactly that which our contemporary states—the desire to gain in capacity. On American railways, if a freight locomotive could be made to haul three or four more cars by contracting the exhaust nozle, and thus increasing the rate of combustion, the change has been made, and the money saved has paid several times over for the extra fuel consumed. It is probable that this fact more than any other explains the difference in fuel consumption between American and foreign locomotives; but it is a difference which is not essential and which may not always work as advantageously in other countries as it has in the United States. In many foreign countries coal is very expensive, and the volume of traffic is not such that large hauling capacity is an essential feature of a successful locomotive as in the United States. For service in such countries we know of no reason why American locomotives should not be built to give a fuel economy as high as any recorded for foreign locomotives. If they do not, then we must look to either faulty design or faulty management for an explanation."

Effect of Machinery on Agriculture.—The wonderful effect of agricultural machinery in increasing the output of farming land and cheapening the price of farm products, while at the same time raising the wages of the laborers, is illustrated by a recent statistical report issued by the United States Department of Agriculture. Some facts in this report are thus referred to in the *Revue Scientifique* (June 1):

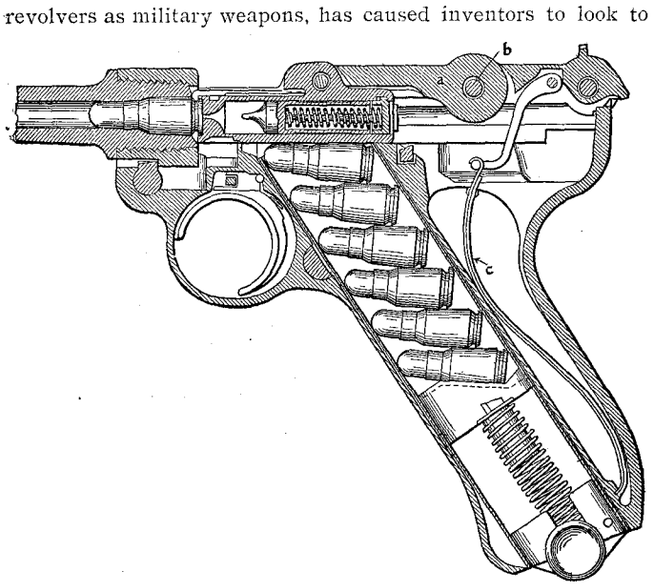
"In 1855 the total working-time necessary to produce a bushel

of corn was 4 hours 34 minutes, and the price of this work amounted, on the average, to 35¾ cents. . . . Machinery [to-day] does in one minute the work that took hand labor 100 minutes to do fifty years ago, and the final result then was inferior in quality. Instead of the four hours and a half then required to produce a bushel of wheat, the time has been reduced to 34 minutes and the work costs only 10½ cents. This shows that the product can be sold cheaper and that consequently there will be more consumers, but the laborer earns more than formerly with less exertion, since the price has not decreased in the same proportion with the time employed.

"Similar conclusions are reached with regard to other agricultural products. . . . In 1830 the labor necessary to obtain a bushel of wheat took 3 hours 3 minutes; to-day the corresponding time is only 10 minutes. The difference is much greater than in the preceding example because wheat is easier to treat mechanically than Indian corn. The price of production has fallen from 17¾ cents to 3⅓ cents! . . . All these examples are very characteristic, and show that agricultural work, like all other industries, must have free recourse to machinery to produce cheaply, and hence to make headway against foreign competition."—*Translation made for* THE LITERARY DIGEST.

THE LATEST AUTOMATIC PISTOL.

THE Luger automatic pistol, a weapon that has just been adopted by the Swiss Government and has been tested by the United States War Department, is described in *The American Machinist* (May 16) by G. H. Powell. We are reminded by this writer that the limited range of the revolver is largely due to the escape of the powder gas about the cylinder. This fact, in conjunction with other well-known drawbacks to the use of revolvers as military weapons, has caused inventors to look to



SECTIONAL VIEW OF LUGER AUTOMATIC PISTOL.

the principles employed in magazine arms for a solution of the problem of an improvement of this essential small-arm. Says Mr. Powell:

"What is known as the automatic pistol of to-day seems almost a perfect realization of the ends sought. Tho called automatic, this weapon is in reality only semi-automatic, as successive pressures on the trigger are necessary to its operation.

"This weapon is a repeating arm in which the force of the expansion of the gas—the recoil, or 'kick'—is utilized after each shot to open the breech-block, extract the empty case, cock the firing-pin, and, by means of a recuperative spring, charge the pistol with a new cartridge, the operator merely having to press the trigger for each successive shot."

Says the paper just mentioned in an editorial comment:

"The performance of this Luger pistol is remarkable, as shown by tests of army boards. Twenty-four shots were fired from it at the rate of 116 a minute. This included the time of removing two empty magazines and inserting two loaded ones, so that the rate of firing one magazine charge, or eight shots, must of course be considerably faster. In the accuracy test the mean deviation of the shots was shown to be only slightly more than 0.5 inch at a range of 75 feet. It was taken apart in 3¾ seconds and reassembled in 12½ seconds.

"It also stood the remarkably severe dust and rust tests very well and gave every evidence of being the very best military pistol presented before the trial board. After being immersed in a solution of sal ammoniac and allowed to remain until thoroughly rusted, it was without cleaning fired as a single breech-loader, and after being simply oiled, without disassembling, worked automatically as before. It is thought probable that the United States army authorities will adopt it for army use, in which case it will be manufactured here."

Oxygen for Balloonists.—"The investigations of Bert," says *Cosmos*, "have made clear the action of oxygen on organisms subjected to feeble atmospheric pressure. His numerous experiments have shown that the accidents to which one is exposed in rarefied air can be avoided by keeping nearly constant the quantity of oxygen taken in at each respiration. Accordingly, since his time, aeronauts have carried with them oxygen which they breathe through a flexible tube fitted with a mouthpiece. M. Cailletet [in a paper read before the Paris Academy of Sciences, April 29] remarks that this method of taking the oxygen is defective. Ever since birth we have been accustomed to breathe through the nose, and aeronauts, no matter how much attention they may give to the matter, have difficulty in giving up this habit and breathing through the mouth. Thus the oxygen inspired through the mouthpiece scarcely fills the mouth and is ordinarily rejected without having penetrated to the lungs. The author presented to the Academy an apparatus enabling aeronauts to carry and have at their disposal large quantities of oxygen stored in small volume, and to assure the absorption of the gas without taking any particular care. It is composed (1) of one or several vessels containing liquid oxygen; (2) of a recipient in which this is turned into gaseous oxygen; and (3) of a kind of mask which renders the respiration of the gas certain. Pure oxygen almost always causes nausea and illness. To avoid this, M. Cailletet has placed in the mask a shutter with variable opening, enabling the wearer to mix with the oxygen a certain volume of air. The aeronaut regulates this opening so that the oxygen increases in amount with the height, and with the object of preventing the condensation of the water vapor contained in the respired gases, he allows it to escape by a flexible tube furnished with a special valve and hidden under the aeronaut's clothes to prevent freezing."—*Translation made for* THE LITERARY DIGEST.

SCIENCE BREVITIES.

THE so-called respiration of plants is a well-known botanical phenomenon. Now, if we may credit *La Science pour Tous*, a Chilian botanist has discovered a plant that not only breathes, but also coughs and sneezes. "The least grain of dust that alights on the surface of one of its leaves will provoke a cough. The leaf becomes red and a spasmodic movement passes over it several times in succession, while it gives out a sound exactly like that of sneezing. One is tempted to cry out 'God bless you!'"—*Translation made for* THE LITERARY DIGEST.

"IN view of the great interest that has recently been excited by Gaylord's article regarding the parasite of cancer," says the Philadelphia *Medical Journal* (June 8), "some recent work performed in the laboratory of Professor Wyssokowitsch may be of interest. De Meser, having observed some lycopodium spores in the interior of a cancer of the skin, which had evidently been derived from the powder that had been used in dressing it, called attention to the extreme difficulty of distinguishing between parasitic bodies and particles of foreign material absorbed from the surface. Konstantinowitsch having become interested in these cases, endeavored to determine just what effects different bodies, such as the spores of lycopodium, would produce when injected into the skin. He found that as a matter of fact, they produced growths not dissimilar from ordinary granuloma, containing epithelioid and giant cells. This is only an additional illustration of the very important part that mechanical conditions play in the development of tumors, an element that was recognized nearly half a century ago by Virchow, and which, in the eagerness to discover a parasite or to explain their origin as a result of some disturbance of the embryological mechanism, has been again and again forgotten. The experimental work to be done with regard to tumor formation is very considerable, and it is strange that pathologists have neglected it so much."