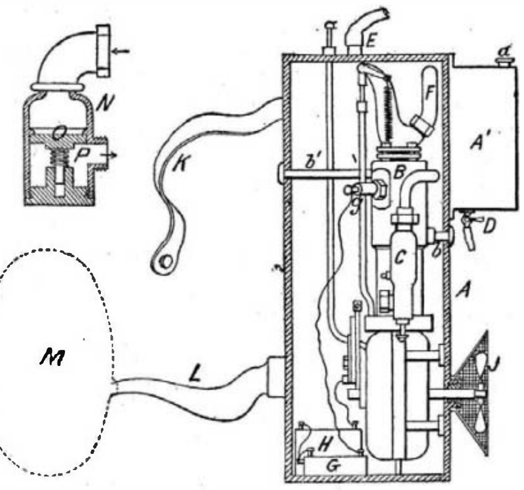
pit, and driving them around until it is well mixed. At the tables the molders press the clay by hand into the wooden forms, two or three bricks to the form, using water liberally. Boys carry the forms to the field, which is dug up into long parallel rows, smoothed off very carefully on top, and just wide enough for the bricks in one form. It is quite a trick to shake the soft clay free from the form without spoiling the bricks. In fact, they are usually rough and irregular. Here is the great difficulty in the South African "slop" brick, and just here our



Details of the Motor.

little repress made a vast improvement possible. In the usual practice the wet bricks are covered with grass and allowed to dry slowly, until beyond danger of cracking in the sun. Then they are dried as fast as possible, and when a few thousand are ready they are put into a kiln and burned.

We allowed them to dry under cover for five or six days, then we repressed them and stacked them loosely in piles to finish drying. Two molders averaged nearly 4,000 brick daily, and by putting four of the best men on the repress, we were able to take care of them. One man with wheelbarrows wheeled the bricks from the field to the machine, and two carried them away to dry, making seven men engaged in repressing. The record run for both molding and repressing was approximately 5,000 in a day of little more than nine hours.

This is commonly supposed to be a land of cheap labor, and the cost of manufacturing may be of interest. The molders were paid $10 per month, the best men on the repress $6.25, ordinary laborers $4.25, and boys $1 to $3 per month without food. About thirty men were employed, and the bricks cost approximately $4 per 1,000 when burned, not taking into consideration the loss in burning.

Repressing costs nearly 30 cents per 1,000, and easily doubles the value. Our brick are the wonder of all the district, and others say they will try to duplicate them.

The manufacture of tiles is very similar, but far more difficult and not so satisfactory. The clay was put through the mill three times, well tramped by boys, then worked thoroughly by hand, and molded into thin cakes 1 inch x 7½ inches x 12 inches. These must be kept very carefully covered, and repressed at just the right stage, in order to make perfect tiles. It required two extra heavy men on the lever of the repress to secure sufficient pressure, and 800 per day was about the limit. After repressing, the tiles are again covered with grass till they are quite dry. The cost in the kiln was about $10 per 1,000, but later losses brought the final cost up to nearly $20 per 1,000, and even at that price they were only about half the cost of iron roofing delivered here.

About 90,000 bricks and 16,000 tiles went into the kiln which was much larger than any before attempted in this district, and for this reason was not sufficiently burned. The consequent loss of bricks was small, but the loss of tiles was about 45 per cent, notwithstanding 6,000 were successfully reburned in the face of the assertion by old brickmakers that it could not be done.

The breakdowns and repairs were what might be expected in any country 150 miles from a repair shop, and need not be recounted here. It is hoped that tiles may be made much more successfully this season, as we have made some improvements in the dies. Possibly other readers of the Scientific American working under similar conditions may find in these experiences some suggestions of value.

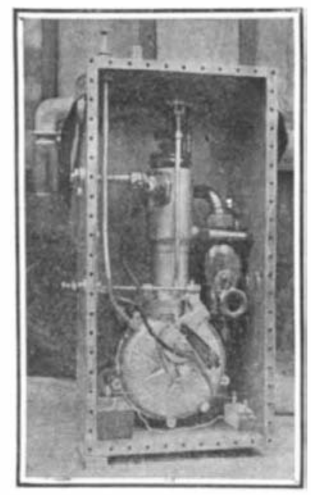
The world's production of Portland cement has increased from 2,500,000 tons to some 11,000,000 tons in the last twenty years, and the center of the industry has shifted from Europe to the United States.

THE SCREW-PROPELLED SWIMMER.

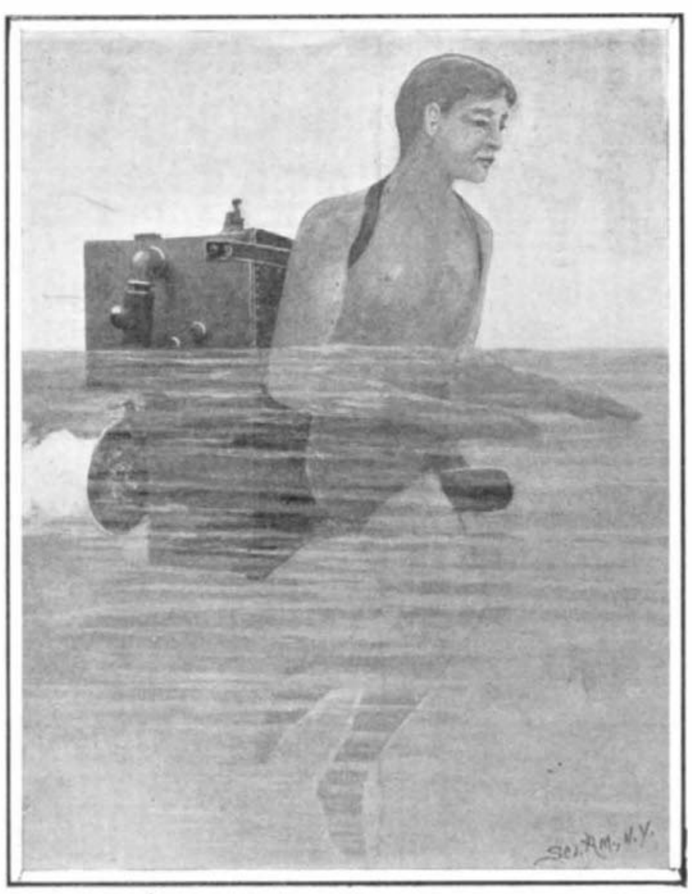
BY THE PARIS CORRESPONDENT OF THE SCIENTIFIC AMERICAN.

M. Constantini, of Paris, after having been successful in adapting a gasoline motor to a roller skate, which we illustrated not long ago, now brings out another use of the motor in the form of a life-saving apparatus or automatic swimming device which can be used for sport as well. Bathers, for instance, can take exercise with the apparatus along the coast. Such an apparatus must be as light as possible, and precautions must be taken so that the motor will work under water in all conditions. A good distance can be covered, even by a novice, which distance is only limited by the size of the fuel tank.

We show three pictures of the life-saving apparatus as it is now constructed. In the first view it is in complete shape, with the exception of the air-bags, which serve as floats. The second view shows the inside of the case with the front cover removed, in which we observe the arrangement of the motor, carbureter, and ignition device. The main body or case of the apparatus consists of a light aluminium box about 20 inches high which is adapted to be carried upon the back of the swimmer. It is just large enough to contain the motor and the rest of the apparatus. The propeller, *J*, which is used to drive the device through the water, is mounted on the end of a crankshaft, and the latter is made to project out through a water-tight packing in the side of the case. To protect the propeller from any shocks it might receive, it is surrounded by a conical piece, carrying a wire gauze covering. The crank for starting the motor is fitted in the usual way upon the projecting end of the motor-shaft. At the top of the case is a pipe, *E*, over which is fitted a rubber pipe going to a float bag (which is not seen here), and this bag serves at the same time to supply the air which is required for working the carbureter during the time when the box may be sunk below the surface of the water. This is only for emergencies, however, and in general the carbureter takes the air through a suitable pipe from the outside. A set of valves controls the air supply in these cases. For cooling the motor cylinder, which is jacketed at the upper part, the water comes from the outside and leaves the box again through suitable openings on either side of the case. Gasoline is supplied from an aluminium tank, A^1, of square section, which is fitted against the back of the case. Below the gasoline tank is placed the outlet valve, *D*, and the rubber hose on this valve is connected in turn to a pipe upon the box, which leads by a metal pipe to the carbureter. To control the working of the motor, two rods pass to the outside. One of these works upon the carbureter to regulate the proportion of gas and air for the mixture; the second rod acts upon the ignition shifting. The exhaust of the motor passes to the outside by the pipe, *b*. To it is connected a special form of muffling-box, which is shown in the section. It is provided with a valve, *O*, which is kept pressed up by the spring when the exhaust ceases. This has been designed so as to prevent the water from entering the exhaust pipe when it is submerged below the surface. Attached to each side of the main case is an air-bag of some size which serves as a float. The swimmer is seated upon a projecting saddle formed of a metal plate covered with cork, *L*. The saddle is hinged to the box in order to fold it up when not in use, and at the outer end is attached an air-float which can be of any convenient size. Two straps are fixed to the upper end of the box so as to fasten it upon the swimmer's back. At the lower end the straps are fastened in place by a hook or a button projecting from the box. The storage battery and induction coil, which are not seen here, are stowed in the lower part of the case under the motor. In order to use the life-saving device, the swimmer first starts up the motor by means of the hand crank from the outside, and, after seating himself on the saddle, puts the box upon his back, tying it by means of the straps. After the air-bags have been filled up, he goes into the water. He regulates the speed of the motor by the two rods we mentioned above, which act upon the carbureter and on the ignition. Steering is done by opening the hands more or less, or inclining them at different angles. Upon reaching the shore, he stops the motor by cutting off the gas supply and the ignition.



The Cover of the Motor Removed.



A WATERPROOF CASING CONTAINING A GASOLINE MOTOR WHICH DRIVES A SCREW IS STRAPPED TO THE SWIMMER'S BACK AND PROPELS HIM THROUGH THE WATER.

The Chimera of the Commercial Synthesis of Foods.

BY PROF. TH. BOKORNY.

For some little time certain of the carbohydrates have been included in the list of substances that can be made artificially, in the laboratory. I do not allude to the commercial manufacture of glucose, on an immense scale, from starch, nor even to the possible production of glucose from still another carbohydrate, the cellulose of wood. I refer to certain preparations which are yet little known outside of a small body of specialists; for example: Butlerow's "methylenitan," Loew's "methose," "formose," and "isoformose," and Emil Fischer's "α-acrose," which have been built up by synthesis from much simpler organic compounds. Just as plants, aided by sunlight, construct carbohydrates from atmospheric carbonic acid, or from formaldehyde, methyl alcohol, etc., so chemists have produced sugars or carbohydrates by agitating formaldehyde with excess of hydrate of lime, or by heating it with magnesia.

But the commercial production of these synthetic sugars will long be economically impossible, owing to the competition of the plants and the sun, which work far more cheaply than man. Cane sugar is worth five or six cents a pound at retail. What hope is there for producing it synthetically at such a price? Potato starch costs less than two cents a pound. The synthetic production of carbohydrates at these prices will scarcely be possible until we have found a way of utilizing solar energy as economically as it is utilized by chlorophyl—and we are yet very far from such a consummation.

Only a very bold and rash spirit can dream that the manufacturing chemist will, within any conceivable period of time, supplant the former as a purveyor of food.

A sober review of the actual facts leads to a very different conclusion. Consider, for example, the cost of converting the albumen of meat into somatose—that is to say, into the substances known to the chemist as albumoses or propeptones. Although somatose is only a slightly *simplified* albumen, it costs ten times as much as the very albumen from which it is derived, and a hundred times as much as vegetable albumen. There have recently appeared, even in popular journals, reports of the synthetic production of albuminoids in the laboratory of the eminent chemist Emil Fischer, of Berlin. From the considerations given above, however, it would appear that this synthesis is likely to have as little immediate practical value as is possessed by the earlier synthesis of carbohydrates.

In regard to foods, the task of chemistry will continue to be the study of their chemical constitution and structure, the knowledge of which is of inestimable value in medicine and biology.

The synthetical production of foods is not at present a problem worthy of the attention of serious-minded chemists.—Translated for the Scientific American from Umschau.