the film is continuous over the area of the faces, then F , the force necessary to pull the blocks apart, is expressible as $F=2AT/d$, where A is the area of the faces, d their distance apart, and T the surface tension of the liquid. F , A and T being known, d can thus be calculated. Taking the constants for paraffin, it was found that the faces were theoretically 0.000005 of an inch apart.

Microscopic examination of the smeared faces, however, revealed the fact that the film was not continuous, but really composed of small drops, which in the process of bringing the blocks together were drawn out into finelined. The total length of these lines was measured, and assuming that the separation of the blocks took place by the rupturing of the fluid, Mr. Budgett calculated what proportion of the rupturing force was due to surface tension. In the case of paraffin he found that not more than 1 pound could be attributed to this cause. Hence, of the total force of 27 pounds required to pull the plates apart when paraffin is the medium composing the film, 1.1 pounds may be attributed to the pressure of the atmosphere and 1 pound to surface tension. The remaining 25 pounds or so are due to the actual tensile strength of the liquid. By microscopical examination Mr. Budgett came to the conclusion that not more than one-tenth of the surfaces was covered by the liquid. Hence the tensile strength of paraffin is $24.9 \div 0.07$, or 355 pounds per square inch. Similarly, for water the tensile strength

is found to be 443 pounds, and for turpentine 371 pounds per square inch. These values are very much higher than those previously thought to be correct. In conclusion, we may state that Mr. Budgett has found that soft metals will not stand the stress put upon their surface by the film of fluid. Pieces of the polished surface may actually be dragged out in the effort to rupture the film. This effect is very noticeable in the case of glass. It is essential, therefore, that optical proof planes should be perfectly free from grease before use, as otherwise they will be ruined. Opticians do take this precaution, but it is probably more as a matter of routine than from any known reason why it should be necessary.

International Commission on the Cost of Living

A Movement of World-wide Scope and Importance

WITH the support of leading economists, financiers, editors, and statesmen, a movement has been launched to secure the appointment of an official international commission on the cost of living.

The objects of the proposed commission are:

1. To gather all available facts as to recent changes in wages, cost of living and prices generally throughout the world, and to make international comparisons.
2. To secure evidence as to the main causes of these changes and of international differences.
3. To discuss possible remedies.

I. THE FACTS.

The price statistics hitherto published are very limited in scope and are not fitted to indicate the price movements of the civilized world. Such index numbers of prices as have been published are usually confined to the wholesale prices, and in all cases cover only a small part of the field of general prices and wages, even where the statistics are of the best, as in the United States, England, and Germany. Moreover these index numbers are constructed by different methods in different places and in consequence are not mutually comparable. Thus a recent attempt of the English Board of Trade to compare its index numbers of prices for "foods and materials" with corresponding statistics elsewhere required a reclassification of the latter by which certain commodities were introduced, others omitted, and still others transferred from "foods" to "materials" and vice versa.

A complete study of the facts would afford a general view of the differences between different countries and times so far as concerns:

(a) The purchasing power of the dollar or other monetary unit.

(b) Purchasing power of incomes, especially wages.

These two sorts of purchasing power do not always change together. Thus, if all prices and wages rise equally, it is clear that the purchasing power of the monetary unit must fall, though the purchasing power of wages will have remained the same. But if the rise in the prices of goods for which wages are spent is greater than the rise in the wages themselves, it is clear that there has been not only a diminution in the purchasing power of the monetary unit, but also a diminution in the total purchasing power of the wages, that is, a diminution in "real wages."

Both problems are of the greatest importance and the prospect of adding to our knowledge as to either of them would be a sufficient justification for the creation of the proposed commission. It is believed that the commission can throw light on both problems; for the raw materials for constructing index numbers exist in published and manuscript documents in every commercial country and only require clerical work under intelligent direction in order to be wrought into index numbers of real value.

II. THE CAUSES.

Here also the commission will have two problems:

(a) To explain the fall in the purchasing power of the monetary unit.

(b) To explain the changes in the total purchasing power of incomes, especially wages.

The first problem (a) is that of the rise of prices and will resolve itself chiefly into two parts: (1) a

study of money and (2) a study of goods. The former will include a study of the production of gold, the extension of credit through the use of checks, uncovered bank notes, modern methods of indorsement, underwriting, etc., and the velocity of circulation of money; the latter will include a study of the conditions of production, transportation, and the volume of trade in respect to agricultural, mining, and industrial products.

The second problem (b) is that of the factors influencing the world's supply of food and other commodities which bear upon the great mass of consumers, as well as changes in standards of expenditure, concentration of population in cities, and all other factors which affect the people in their capacity as consumers.

III. THE REMEDIES.

The commission will again be confronted with two problems:

(a) The problem of preventing changes in the purchasing power of the monetary unit, as for instance through monetary or banking legislation; and

(b) The problem of increasing or at any rate of preventing any decrease in the total purchasing power of wages, by combating mal-nutrition and the decay of industrial efficiency.

Those chiefly interested in the project of a commission on the cost of living do not agree on any remedy or remedies. They are agreed merely on the importance of the questions involved. The commission would not, of course, be authorized to bind the various nations represented to the adoption of any plans that might be recommended. It would simply aim to express the best unbiased scientific conclusions which they may find from a more complete study of facts than has hitherto been made.

Should it happen that the commission reported favorably any plan requiring political co-operation, the way would then be open for the various nations to enter into diplomatic negotiations looking toward such co-operation, just as was the case when the "Latin Union" was formed to secure uniformity in currency or when various nations agreed to prohibit the poisonous match industry.

WHY THE COMMISSION SHOULD BE INTERNATIONAL.

The commission should be international because the problems are necessarily international. Even the inflation of the currency of one country must spread its effect over all; for much local inflation, by expelling any exportable money such as gold, leads to inflation abroad. We cannot expect investigations by individual nations to be made by a sufficient number of nations or any one nation to make international comparisons for all. A few attempts at international comparisons on the cost of living have been made (as by Carroll D. Wright, when United States Labor Commissioner, and more recently by Dr. Shadwell in England and by the British Board of Trade). But the results are meager and confined to a very few countries. Moreover these results are little heeded outside of the particular nation making the investigation.

It is almost as absurd for any one particular locality or State, on the basis of its own experience, to discuss the world-wide rise in the cost of living, as it would be for a village on the Bay of Fundy to dis-

cuss the rise of the tides. They experience this rise, but its cause lies far beyond their vision or control.

WHY THE COMMISSION SHOULD BE OFFICIAL.

The commission should be official in order to secure the requisite funds for so broad a study. No private person or institution can afford to make the necessary investigations in all the great countries of the world, just as no private person or institution can afford to make a census. It is true that our best statistics today are official statistics, and this will be increasingly true in the future. Another reason why the commission should be official is that an official commission has many times the influence of private persons or institutions.

The work of the commission should be intrusted to a small staff of experts working in co-operation with the local statistical agencies of the various governments represented and acting on plans approved by the commission.

As a possible result of the work of the commission there might be established one or more permanent bureaus to continue these studies; for the need of more complete statistics of wages and prices is increasingly felt every year.

THE PRESENT A VERY OPPORTUNE TIME TO SECURE SUCH A COMMISSION.

There is now a world-wide interest in the subject, not only in academic circles, but also among business men, bankers and railway men, public officials, members of Parliament, labor leaders, and the public press. During the last few years there has been an enormous output of literature on the subject—in statistical works and journals, in popular magazines and in newspapers, and in official reports. The Verein für Sozialpolitik in Berlin is planning to make some studies of prices during the last twenty years. It has secured the co-operation of the German Statistical Office, which in turn is in correspondence with the statistical offices of other countries. The International Statistical Institute, consisting chiefly of the world's official statisticians, is also engaged in an international study of price movements. Several governments, such as the United States through its Senate, the State of Massachusetts, the Dominion of Canada, and France have made recent reports on this subject; others, such as the government of India, are about to undertake similar studies.

The deep public interest in the question of the cost of living is expressing itself also in many other ways, such as resentment against taxation, strikes, bread and meat riots, and other demonstrations of discontent, as well as in changes in political life, to which a great part of social unrest is due. It is therefore an urgent need to find a scientific basis for any reforms which State legislation may be asked to contemplate.

In view of the colossal proportions of the problem and its significance to hundreds of millions of human beings and in view of the present world-wide interest in it, and in view of the ominous prediction of many experts that the rise of prices is to continue in the future, it is submitted that to secure such a commission as is here proposed is worth the best efforts of all public-spirited citizens.

The Perpetual Calendar - Its Reproduction as a Lost Art

By L. J. HEATWOLE, Co-operative Observer U. S. Weather Bureau.

Who would not think the mechanic eccentric and even foolish, who uses a foot rule of different standard lengths for measuring distances in space or over surfaces? Yet such a principle is being applied from year to year by the calendar maker who enters 31 days for some months, 30 for others, and 28 or 29 for another.

It seems a far more rational proposition to use the natural unit of seven days, or that of a month of 28 days as a system of time measure for the recording of the world's daily events. The irksome and most unsatisfactory method so long in use with the almanac maker for having the fractional part of a week to appear at the beginning and close of a month or year, is very much out of harmony with modern civilization along hundreds of other lines.

That the principles applying to a universal as well as to a perpetual form for the calendar, were solved by the

ancients to perfection, and the results appropriated to public as well as domestic affairs for thousands of years during the first and earliest epochs of world civilization is deduced from the following facts and observations:

In the earliest history of Egypt, whose beginnings date so far back into the past that her perspective becomes utterly lost in the dim distance, there comes to us the account of a calendar that was in use during the entire 4,000 years of her golden age.

From Plato's interesting story of Solon, the Greek

lawgiver's visit to the priests of Sias, who appear to have had their home in a city of that name at the head of the Nile delta, comes the information of a calendar being in use there that determined the length of the year with an accuracy and precision unknown to the philosophers and astronomers of other nations.

And again we note that in ancient Thebes which according to Herodotus extended for 33 miles along both sides of the river Nile, and formed perhaps the greatest center of population the world ever produced, there was a calendar in use that measured time by a system of dates so true in its relation to the motion of the sun and the change of seasons, that it would have been impossible for man to reach such a result except by a series of observations covering a vast and greatly extended period of time.

To ancient Egypt belongs the credit for developing the perpetual form of the calendar; while the division of the week into six days of labor followed by one day of rest, comes down to us from the remotest period of antiquity.

From evidences brought forward by archæologists from Egyptian and Mexican ruins, the rational conclusion is reached that this ancient calendar was not only perpetual in form but was in universal use with several other nations sprung from the same common origin from which the Egyptians trace their beginning.

In this calendar appears the provision for a cycle of five years, of which four were each composed of exactly 52 weeks—while to the fifth year there was added at the end an intercalary week in which no social or national events were recorded, but such time was wholly occupied in the observance of religious ceremonies.

There being an excess of 7 days in every 45 years under this arrangement, it became necessary to omit an intercalary week with every 45th year. In this way the calendar was made to stand in good balance with the true length of the year. The months were of uniform length—while the weeks maintained a stationary position in each month throughout the year. It was this happy feature that gave to the ancient calendar its perpetual form for all time to come; and were this system which so ingeniously introduces the week as the unit of balance still kept in practice, the world might to-day be enjoying the benefits not only of a perpetual but a universal calendar.

With the introduction of the Greek calendar and the one later adopted by the Romans, the perpetual form and other commendable features of the original calendar have been lost to all the nations of modern periods. Since the Greek and Roman conquests the world for more than 2,000 years has been struggling through the maze and tangle arising from the use of a calendar whose months are of unequal length, and where the week shifts from month to month and from year to year in its relation to dates—a system much like that which the dry goods man would find in the use of several yardsticks of unequal length for measuring a single piece of goods.

From year to year the almanac maker has encountered the needless inconvenience of shifting the days of the week out of the relation in which they stood to the dates of the month during the previous year. In the reconstruction of the calendar a system of dates should follow that restores the week to its ancient position as a stationary feature of the month as well as the year.

Granting that the leap day system of the Gregorian calendar forms a tolerably correct estimate for keeping the year in balance with the seasons, and with the discovery that the perpetual calendar of the ancients accomplishes the same result in the use of the week as its unit of measure, the two forms readily admit of a combination in which the columns of dates can stand side by side—the one preserving its records exclusively for the past, while the other comes for the establishing of its own records for all time to come.

Knots and Splices

THE latest addition to the curricula offered at the Massachusetts Institute of Technology is a course in knots and splices. This has been arranged for at the suggestion of Major E. T. Cole, U. S. A., the new instructor in military science, who will conduct the course personally. When one considers how closely the engineer is related to work of construction in which, especially in the field, such things as trestles, gins, shears, holdfasts, and even rafts of planks or barrels are of daily occurrence, the need of a good knowledge of knots and lashings will be seen to be necessary.

Something like two dozen knots, bonds and hitches will be shown, the appropriate use of each as well as the very important precaution of avoiding knots that are unsafe. The course is based on that taught to the students at the Fort Leavenworth Army Service School. As regards the method of teaching, Major Cole proceeds on the theory that the acquisition of facility in such things as this is largely a matter of automatic memory, and that therefore short lessons at considerable intervals are best.

Trade Notes.

Silver, Gray, (also Japanese).—This alloy is made from equal parts of copper and silver, boiled in a solution of alum with blue vitriol and verdigris.

Driving Belt Dressing.—(a) One part melted tallow, 3 parts train oil, 1.5 parts melted rosin. (b) Two parts of raw tallow, 1 part of train oil, 1 part technical castor oil.

Durable Whitewash.—Slake quick-lime with salt water and reduce with skimmed milk, so that it is thin enough to lay on. This is a durable whitewash, which has the advantage of rendering wood non-inflammable.

Drying Oil (according to Hermann).—One thousand parts of linseed oil is heated with 10 parts of hydrated manganic oxide until it fumes slightly and kept for 15 to 30 minutes at this temperature. This effects a very rapid drying of oil paints thinned with it.

To Color Turquoise and Other Precious Stones (according to A. Kühne).—The stones are cleansed or bleached in a bath, prepared with tartaric acid and blue or green vitriol, and then gradually colored in alcohol by a gradual addition of aniline dyes soluble in water.

Cleaning of Vessels, Vats, etc.—The disagreeable odor of creosote, cod liver oil, petroleum and other substances can easily be removed from vessels of any kind, mortars, etc., by boiling black mustard, meal and water in the vessel, and allowing it to stand aside for a while.—*Pharmaceut. Zeitung.*

Glowing Pictures.—Dissolve 40 parts of saltpeter and 20 parts of gum arabic in warm water. Use this solution to trace out with a pen the outlines of the picture on white paper. All lines must connect with each other and somewhere must touch the edge of the paper. As the drawing can not be seen, the spot where it touches the edge must be marked with a lead pencil. If this spot is touched with a burning match, the paper will glow along the lines traced, bringing out a scorched picture.—*Neueste Erfind. u. Erfahr.*

Ignition Mass.—Rosin of inferior quality is strongly heated until it begins to smoke. Then coarse sawdust and shavings are added in small quantities at a time, and well mixed. The content of the vessel is then emptied on a stone slab and rolled out in sheets $\frac{1}{2}$ inch to $\frac{3}{4}$ inch thick. These are cut up with a hot knife in pieces $\frac{3}{4}$ inch wide and $1\frac{1}{2}$ inches to 2 inches long. The pieces if touched with a lighted match will at once blaze up. They will quickly ignite coal and can therefore be used to kindle a fire.—*Neueste Erfind. u. Erfahr.*

To Bleach Ostrich Plumes.—(a) Bath.—Permanganate of potassium, 4 to 5 parts in 1,000 parts of water, to which an equally strong solution of sulphate of magnesia may be added. Do not heat over 60 deg. Cent. (140 deg. Fahr.). The plumes, coated with a film of peroxide, are washed and finally treated with sulphuric acid of 1 deg. to 2 deg. Be. (b) Bath.—Peroxide of barium, 10 parts in water 1,000 parts; heat to 30 deg. Cent. (86 deg. Fahr.) allow the feathers to remain in the bath 48 hours; wash, pass through a weak hydrochloric acid bath and dry.

Japanese Seals.—Japanese seals (han) are made of wood, stone or metal, with characters or signs engraved or cast on the face. They are used in addition to a signature to represent an individual, a legal person or a corporation. The seals of the present emperor are distinguished as privy and State seals. They are each 3 inches square. The State seal is used mostly upon documents relating to foreign countries and has Chinese characters engraved on it; the privy seals are stamped on imperial rescripts, issued for proclamations at home. Japanese law require that each individual should send in an impression of his seal as a specimen (called jitsu-in) to have it registered and kept in a government office (district office or a city, town, or village office), that it may represent himself in a deed. The material employed to make these seals consists of various kinds of precious stones, gold, silver, etc.; those mostly in use at the present day are of agate, rock-crystal, ivory, rhinoceros, or buffalo horn, shell, marbles, or of cherry-wood, box-wood, and recently India rubber has come in use. There are two ways of engraving characters on a seal, relief and intaglio; in the one the characters in the impression are shown in color, while in the other they are presented in white on colored ground. The ink used for stamping is called niku. It is generally of vermilion red and prepared as follows: 10 parts of cinnabar and 8 parts of castor oil are kneaded for about 20 minutes. The bleached moxa and a little powdered alum are added gradually. This mixture is somewhat stiffer in summer and softer in winter. The cheapest kind of seals are made of box-wood and sold at 5 cents a piece. Most seals are oval in shape, but some are round and others square. They rarely exceed $\frac{1}{2}$ inch in diameter.—*Japan Magazine.*

Science Notes

Average Speed of Parachutes.—In a note communicated to the Académie des Sciences, Ch. Bouchard gives a study of the average speed of parachutes. Starting from the hypothesis that the speed of falling is dangerous when it attains eight meters per second, and that if we designate the total weight by P , and by S the surface of the horizontal projection of the lifting

plane on which the air acts the ratio $\frac{P}{S}$ is variable,

$$P = \phi S V^2$$

$$P = \phi S V^2, \text{ whence } \phi = \frac{P}{S V^2}.$$
The author, however, came to the conclusion that V could not enter the formula with the exponent 2. If we give V the exponent $\frac{3}{2}$ and consequently have $\phi = \frac{P}{S V^{3/2}}$, the values of ϕ deduced from experiment vary little from each other and are comprised between 0.0172 and 0.0193. The value 0.019, which represents within approximately two ten-thousandths, the coefficient of resistance of the air, corresponds to the falling speeds which do not attain eight meters per second.

A Substitute for Bottle Stoppers.—Van Heigendorff recommends the use of paraffin or rubber stoppers having an inner glass body. They can readily be made by covering an old glass stopper having a ground cone with a piece of rubber tubing or a thick coat of paraffin. Instead of solid stoppers, there have recently been

put on the market caps made of rubber. They are shaped as shown in Fig. 1, either plain or with a center hole, and are slipped over the bottle or flask, as shown in Fig. 2. These caps not only cover up the bottles more hermetically than the ordinary tapered stoppers, but also fit, within limits, to necks of different sizes.—*Chemiker Zeitung.*

The New Department of the Japanese Industrial Laboratory.—The most recent addition of the industrial laboratory, Tokyo (under government control) is the Fifth Department, which serves the electro-chemical industry. This has by now become the most interesting and important branch of the chemical industry in Japan, producing large amounts of caustic soda, chlorates, nitrates, carbides, calcium cyanamide, phosphorus, aluminium, etc. As there is natural water and raw material in abundance, the development of this new branch is of great importance to Japan. To call attention to this subject and to carry out necessary experiments, the Government decided last year to establish the electrolytic department as the fifth department of the institution. Accordingly a brick building was set up as a laboratory, and a modern building for an experiment room, employing extra high tension current, a switchboard room, an electric furnace room, a transformer room, a storage battery room and a finishing room. Besides the above buildings, there is a storehouse and a workshop. As to the program of this department, it may be mentioned that work has been begun on the experimental preparation of potassium chlorate from the chloride (obtained as a by-product from the manufacture of iodine from kelp), of aluminium from certain kinds of clays, and of chlorine compounds, to utilize the chlorine is produced in the electrolytic preparation of caustic soda. As far as experiments go, the results are very promising.

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