hydrogen iodide it appears that the life of the complex HO_2 involved in this reaction must be of the order of 10^{-9} seconds, a value much larger than that generally accepted for such quasi molecules.

The solubility of rare earth salts in non-aqueous solvents: B. SMITH HOPKINS and L. L. QUILL (introduced by R. Adams). All the methods of separating the members of the rare earth group, almost without exception, have been applied to aqueous solutions. Separations by these methods are tedious and not effective. Some of the non-aqueous solvents are known to possess differential solvent action when applied to the anhydrous salts of this group. The salts studied have been the anhydrous chlorides and nitrates of lanthanum, cerium, praseodymium, neodymium, samarium and gadolinium. The solvents employed included various alcohols and ethers, ethylene glycol, glycerol, dioxan and ethyl and methyl cellosolve. It has been shown that under favorable circumstances ethyl ether may be used to effect a rapid separation of neodymium and praseodymium.

The value of free energy determinations of organic reactions: DONALD B. KEYES (introduced by W. A. Noyes). To be printed in SCIENCE.

Magnetic moments of atomic nuclei: SAMUEL A. GOUDSMIT (introduced by H. D. Curtis). (Read by title.)

Ceric sulfate, a new reagent in analytical chemistry: HOBART H. WILLARD (introduced by M. Gomberg). (Read by title.)

A geographic study of cosmic rays: ARTHUR HOLLEY COMPTON.

The agglomeration theory of sleep: WILDER D. BANCROFT. It is very generally admitted that the sleep due to chloroform, morphine or alcohol is the same in principle as ordinary sleep, though differing in details. Sleep is therefore due to a reversible agglomeration of some of the proteins of the centers of consciousness by a substance or group of substances which has not yet been identified completely and which we will call X for the present. The concentration of X increases when work is done. The agglomerating effect of X can be counteracted to some extent by the effect due to the irritability of the sensory nerves. It is the balancing of these two effects which makes going to sleep a voluntary action to some extent. A peptizing agent, such as sodium rhodanate, will decrease this irritability and may thereby make sleep possible, though not causing it. We have counteracted the effect of coffee in this way. A larger dose of the peptizing agent may act also on the centers of consciousness and thereby prevent sleep. We make use of that when counteracting the effect of morphine. That one person wakes readily at one noise and another at another is due to conditioned reflexes, the stimulus to which one is conditioned acting like a loudspeaker. Since most of us wake before digestive disturbances become effective, we must postulate the excess production during sleep of a substance—possibly adrenalin—or group of substances which we will call Y. It irritates the sensory nerves and wakes the sleeper eventually, unless he is waked sooner by some other cause—hunger, thirst, need to relieve oneself, light on the face or an alarm clock, for instance.

The functions of the olfactory parts of the cerebral cortex: C. JUDSON HERRICK. In the human cerebral cortex the non-olfactory (neopallial) part is more massive and complicated than the olfactory parts. In the lowest mammals these relations are reversed. The differentiation of the olfactory cortex has culminated in the lowest extant mammals with little farther specialization in any higher forms, but the neopallium is progressively elaborated from meager beginnings in primitive mammals up to the human complexity. It is suggested that the olfactory cortex performs two dissimilar functions: (1) a specific participation in associational processes, similar to that of other sensory systems, save for lack of any participation in the localization of the source of the stimulus; (2) a non-specific activation or inhibition of cortical or subcortical activities whose pattern of performance is dependent upon the non-olfactory components of the total situation. Similar specific and non-specific functions are performed by all cortex. In neopallium specific and localized functions predominate, more so in higher mammals than lower. In the olfactory cortex of all mammals the non-specific type predominates. In lower forms, where neopallium is small and undifferentiated, cortical functions are more nearly equipotential than in higher forms where olfactory cortex is relatively small and neopallium is large and highly specialized.

(To be continued)

SCIENTIFIC APPARATUS AND LABORATORY METHODS

AUTOMATIC WATER-LEVEL REGULATOR FOR AUTOCLAVES

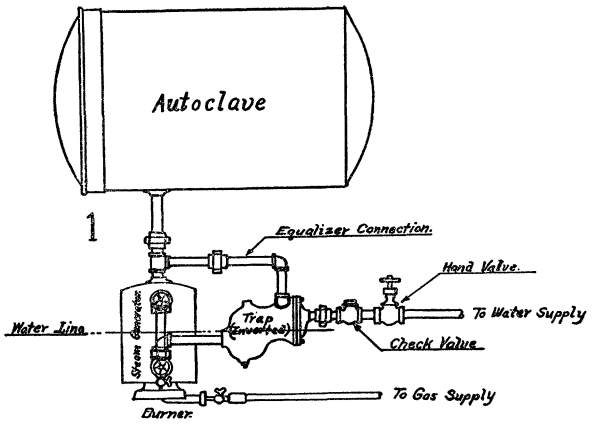
MANY laboratories are equipped with the horizontal steam pressure autoclave, which is not supplied by a live steam main but depends on steam from water boiled in a generator directly beneath the sterilizing chamber and connected to it by a pipe. In the usual operation of the apparatus, the generator is filled two thirds full of water by a hand-operated valve on the water system line, a gauge on the generator indicating the desired level. There is then sufficient water for sterilization at 15 pounds for a short period of time, but the operator must glance at the gauge occasionally to make sure that the water level has not dropped so low that the intense heat from the gas flame will burn out the generator. Should the water level drop, the operator can let more water into the generator and continue sterilization. This constant

watching of the autoclave, however, has proved to be a burden, as quite often the attention of the operator may be focused on other work in the laboratory or he may be called from the room and thus not notice that the water level in the gauge on the generator has become dangerously low. In such cases the generator is apt to burn out before the water level is corrected. When such an accident occurs, the resoldering of the generator is expensive, and oftentimes serious difficulties arise because of loss of time from productive work.

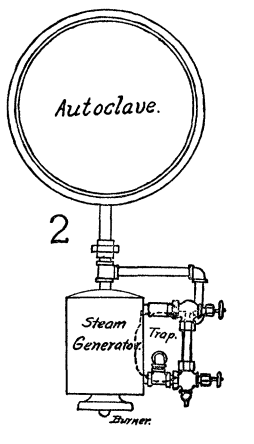
In seeking for an automatic water-level regulator to safeguard the apparatus against such an accident, and also to give the operator greater freedom while sterilizing material, the following device was found to be inexpensive, simple and at the same time to meet the requirements demanded. A closed float type of steam trap such as the No. 00 Junior Steam Trap, as manufactured by the G. V. Anderson Co., Cleveland, Ohio, was found to be well adapted for such use, as it was easily converted into a water-level regulator. The appearance of this trap when used in the conventional way may be seen in Fig. 3, with openings marked as used when the trap is in this position. In this position, the trap slowly collects the water of condensation from the system to which it is attached. When enough water has been collected, a float is raised, opening a valve, and the water is discharged into a drain or return pipe. When the trap is inverted (Fig. 4), it may be used as a water-level regulator with the following changes made in the use of the openings: the outlet and inlet are reversed, the drain opening becomes an equalizing connection and the air vent opening is used to drain the trap of sediment. By inverting the trap and connecting the opening now marked "inlet" to the main source of water supply and connecting the opening marked "outlet" to the bottom of the generator, the action of the float and valve shuts off water from the supply line when the trap and generator to which it is connected are full. When the water level in the generator is lowered during the use of the autoclave, the float is lowered, opening the valve and allowing more water to enter until the generator is again filled, after which it shuts the water off. Thus, by inverting this closed float type of steam trap, its function is changed to that of a water level regulator.

The trap, when inverted, is connected to the generator in the following way: the water-gauge is set off from the generator by adding to the generator a space nipple and coupling at the top connection, and a close nipple and tee at the bottom connection (Fig. 2). The gauge fittings, when screwed back into the tee and coupling, respectively, are in alignment for the insertion of the glass tube. The tee at the bottom of the gauge leaves an opening into which a connection may be made from the discharge of the inverted trap (Fig. 1). The equalizing connection from the top of the trap in its inverted position is screwed into a tee which is placed in the pipe going from the top of the generator to the bottom of the sterilizer. This tee is placed in the pipe immediately at the top of the generator; this connection keeps the pressure in the generator and trap equal. Both the equalizer and water connections from the trap to the generator are made as short as possible to furnish adequate support for the trap, and are also made in such a way as to hold the trap level and at the desired height to supply the generator with the right amount of water, as is determined by reading the gauge.

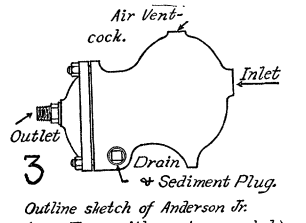
A hand-operated valve is placed in the water supply line close to the trap. This valve is used to shut the water off if the trap has to be removed at any



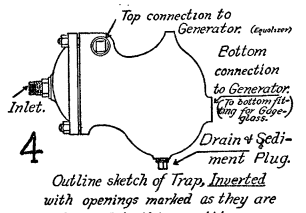
Side Elevation
Showing details of Connections.



End Elevation.)



Outline sketch of Anderson Jr. steam Trap with openings marked.)



Outline sketch of Trap, Inverted with openings marked as they are to be used in this position.

time, but while the trap is attached to the generator and ready for work this valve must be left open, as the water supply to the trap must be free to feed the trap when it is in use. A check valve may be placed between the hand-operated valve and the trap to guard against loss of water from the generator if the water pressure should become lower than that of the autoclave.

Precautions must be mentioned in connection with the use of an appliance of this kind. The trap selected should have a steam trap pressure rating of from 20 to 25 pounds more than the regular pressure on the water system. Also, this system, in order to function successfully, must be supplied from a water supply in which the minimum pressure is at all times from 10 to 15 pounds greater than the maximum pressure at which the autoclave is to be operated, and all the fittings and pipe used in connecting the trap to the generator should be of brass.

The application of this equipment on an autoclave in these laboratories was found to be relatively inexpensive, as the total cost, including all materials and labor, came to $22. Since the cost of repairing a burned generator has, in the past, amounted to half of the above figure, the installation of this water-level regulator to prevent such an accident seemed advisable. The work was easily done by an ordinary maintenance mechanic without interfering with the regular laboratory schedule. This water-level regulator has worked in a very satisfactory way for a period of four months; it has eliminated the constant watching of the autoclave when it is in use, and has enabled the operator to attend to other duties in normal routine work without increasing the danger of burning out the apparatus. Knowing the difficulties experienced in our own laboratories previous to the installing of this device, it is hoped that this information will prove of value to other institutions faced with similar difficulties in operating this type of autoclave.

NORMAN F. CONANT
LABORATORIES OF CRYPTOGAMIC BOTANY
HARVARD UNIVERSITY

THE SUPPRESSION OF SULFURIC ACID MIST IN KJELDAHL DIGESTIONS

As is well known, Kjeldahl digestions, as usually conducted, are always associated with the escape of very irritating and corrosive mist of sulfuric acid, continuing throughout the digestion.

Attempts to abate this nuisance have usually been in the direction of disposing of the mist after its issuance from the digestion flask, by placing the mouth of the flask through a hole in a leaden pipe, which in turn has an exit leading outdoors.

We have adopted the idea of preventing the escape of the mist of sulfuric acid from the flask, while permitting the steam, sulfur dioxide and carbon dioxide formed in the process of digestion to escape freely. This mode of procedure permits the digestion to be performed on the laboratory table, doing away with the special fume closet or special digestion rooms, which, as we well know, are places to be shunned.

We have found that the object stated above, *viz.*, the prevention of the escape of the mist of sulfuric acid and the simultaneous free exit of steam, sulfur dioxide and carbon dioxide was accomplished when we inserted in the neck of the digestion flask a snugly fitting tube of alundum, closed at the bottom and flanged at the top so that it might be supported on the flange of the flask.

If desired, though it is scarcely necessary, a stopper and delivery tube may be inserted in the mouth of the alundum tube, thus providing a means for leading the sulfur dioxide, etc., into soda lime or any other convenient absorbent.

At the end of the digestion the alundum tube may be withdrawn and filled with water, thus washing it out and permitting the recovery of any traces of spray containing ammonium sulfate, and their return to the digested fluid in the flask.

The device will be found simple, cleanly, convenient, inexpensive and efficient.

ABRAHAM HENWOOD
RAYMOND M. GAREY
CENTRAL HIGH SCHOOL, PHILADELPHIA, PA.

SPECIAL ARTICLES

THE ATOMIC WEIGHT OF LEAD FROM CYRTOLITE

LEAD contained in the thorium-free mineral cyrtolite occurring in Bedford, New York, was extracted with hydrofluoric acid and purified by crystallization as nitrate and chloride and by sublimation in hydrogen chloride. Weighed quantities of fused salt were then precipitated with weighed, nearly equivalent amounts of pure silver and the exact endpoint of the reaction determined nephelometrically by the equal-opalescence method. Comparison experiments were carried out with common lead (atomic weight 207.22) and lead from Swedish kolm (atomic weight 206.01).

The result of the experiments with cyrtolite lead