

naked eye, according to the particular bacterium present, and we soon become familiar with the characteristics of particular germs. Cultures of bacteria are usually made in test-tubes containing peptonized gelatine, coagulated blood-serum, etc. Let us return to our gelatine-plate. We find a spot which answers the description of a colony of tubercle bacilli. We now take a minute particle from this colony on a wire, and convey it to the surface of some hardened blood-serum in a test-tube. We plug the tube so that no air-germs may drop in, and place it in an incubator at the proper temperature. After several days, if no contamination be present, a colony of bacilli will appear around the spot where we sowed the spores. Let us repeat the process, take a particle from this colony, and transfer to another tube; this is our second culture. This must be repeated until we are satisfied that we have secured a "pure culture." If this be carried to the twenty-fifth generation, we may be assured that there remains no pus, no *plumains*, nothing but the desired bacilli. It is a proper material now for inoculation.

Practically, many precautions have to be thrown around every step of our work. You can see that spores might accidentally be attached to our tubes. They must be sterilized. This is accomplished by exposing them to prolonged high temperature in an oven. Similar precautions are taken with the plug of cotton used to stop the mouth of the tube. The wire must be heated to redness always just before using. We are in constant danger of contamination, and sometimes fail even with the utmost care. Fortunately, we can determine whether everything is as it should be. If a tube shows signs of admixture, it is discarded at once and another trial made.

Negeli has proposed a "dilution method" for obtaining "pure cultures." He had some urine containing large *micrococci* which he wished to cultivate. The urine also contained numerous *bacilli*. A single drop of the urine, supposed to contain five hundred thousand bacteria, was mixed with about two ounces of pure water and shaken thoroughly. This dilutes the urine a thousand times. One drop of this is now mixed with another two ounces of water, and a millionth dilution was obtained, in which every drop must average to contain one bacterium. He inoculated ten tubes of gelatine each with one drop of this dilution. After incubation it appeared that four tubes remained sterile, one contained bacilli, and five the desired cocci.

You will find in our Biological Laboratory the modern appliances for sterilizing the fluids, vessels, etc., as well as several incubating ovens, the temperature of which may be maintained at a given point for months. The large incubator constructed by Dr. Miller will accommodate several thousand culture-tubes at once.

We have, then, finished the second step in our work, that is, we have obtained our bacilli pure, and have cultivated them through several generations, and it is improbable that our culture-tubes contain any contamination from the original source of our supply of bacteria.

It remains for us to complete the work, that is, we must now reproduce the disease by inoculation with our pure culture. Now, we are forced to resort to the lower animals for experiment. No one, as yet, has sufficient admiration for science to inoculate himself. Hence it is impossible to complete a perfect chain of evidence. Objection can be reasonably made to the employment of mice and Guinea-pigs. It is just possible that deductions from such experiments would not hold with human beings. But there seems to be no alternative. We proceed to inoculate several Guinea-pigs with our pure culture of tubercle bacilli. The following are the results as first obtained by Koch, and which are almost identical with the phenomena obtained in our own work. The utmost care having been taken to avoid contamination of our virus (by heating the inoculating needle red hot just before using), a puncture is made through the skin, and a few drops of pure culture injected into the loose areolar tissue of the neck.

"The wound generally closes on the second day. The inguinal and axillary lymphatics become swollen on the eighth day. From this time the animals lose weight rapidly, and die in four or five weeks from the time of inoculation. In the spleen and liver the characteristic tubercular changes are found." Koch's results led him to believe that "the bacilli occurring in tuberculous substances were not merely the attendants of tuberculous processes, but the cause of them, and that the *bacilli* actually represented the true *tubercle-virus*."

I have spoken thus of the tubercle-bacilli in order to give you a general notion of the processes employed and the precautions necessary in this work. The steps are nearly the same with the bacteria found in other diseases. The same extraordinary precautions are always necessary to avoid contamination. Some thrive in one fluid, some in another, some at ordinary temperatures, some at the body-heat.

From my remarks thus far you may have inferred that it is a very easy matter to find the bacterium of any particular disease, but I must correct this error. Let us place a particle from the discharges of a cholera patient under the microscope. Among the objects filling the field are numerous little curved rods—the comma bacilli. But if you now substitute a drop of fresh normal saliva for the choleraic discharge, you will find little curved rods in every respect like the commas of cholera. I may as well say at once that the microscope alone will not enable us to determine whether a given bacterium is pathogenic or not. You have already seen that each species possess peculiarities of growth in our culture-tubes.

Bacteria also frequently afford peculiar chemical reactions. For example, nitric acid will discharge the color from all bacilli, artificially dyed with anilin, except those of *tubercle* and *anthrax*. One species is stained readily with one dye, that leaves another unaltered. Thus we are enabled in the laboratory to determine whether the bacilli found in sputum, for example, are from tubercle or are the bacteria of decomposition.

From what I have said of the tubercle bacillus, it would seem as thoroughly demonstrated that it was the cause of tubercle in these animals. But we must walk cautiously here. These are not human beings; who knows that like results would follow their inoculation? The animals used by Koch were animals very subject to tubercle.

We must, from the very nature of our environment,

be constantly inhaling these germs as we pass through the wards of our hospitals—yes, they are floating in the air of our streets and dwellings. It becomes necessary for us to inquire, If bacteria cause disease, in *what manner do they produce it?* Ziegler says: "The healthy organism is always beset with a multitude of non-pathogenic bacteria. They occupy the natural cavities, especially the alimentary canal. They feed on the substances lying in their neighborhood, whether brought into the body or secreted by the tissues. In so doing they set up chemical changes in these substances. While the organs are acting normally, these fungi work no mischief. The products of decomposition thus set up are harmless, or are conveyed out of the body before they begin to be active." If bacteria develop to an inordinate extent, if the contents of organs are not frequently discharged, fermentation processes may be set up, which result in disease. Bacteria must always multiply and exist at the expense of the body which they infest, and the more weakened the vital forces become, the more favorable is the soil for their development.

Septicæmia is caused by the absorption of the products of putrefaction induced by bacteria. Before bacteria can multiply inside or outside the body, they must find a congenial soil. The so-called cholera bacillus must gain access to the intestinal tract before it finds conditions suitable to colonization. They do not seem to multiply in the stomach or in the blood, but once injected into the duodenum they develop with astonishing rapidity. The delicate epithelial cells of the villi become swollen, soften, and break down, exposing the mucosa.

But it becomes us to proceed in this matter with great caution. We must avail ourselves of every means of research, and patiently endeavor to ascertain what of pure gold there is in this new field of study. The subject is a fascinating one, and it seems to settle, or at least open the way of settling, so many hitherto difficult questions in pathology that it has been accepted by many without such a basis of facts as every careful investigator should demand. Another very extensive and important field opened by bacteriology is that of the prevention of disease by inoculation of attenuated or modified bacterial matter.

Pasteur, experimenting with the bacilli of anthrax, found by exposing the microbes to a certain temperature, higher than that most favorable for their development, they lost their virulence to such an extent that he could vaccinate sheep without danger; and that animals so vaccinated were, for a given time, rendered incapable of contracting anthrax. Various opinions are held regarding the value of these experiments at present. You are all familiar with the newspaper accounts, at least, of Dr. Ferran's experiments with the cholera inoculation. We are not at the present time able to speak with any degree of positiveness regarding the value of this work.

What is to be the future of the very interesting and fascinating studies to which I have this afternoon briefly directed your attention, no one as yet can determine. It is in the hands of ardent students, who are everywhere carrying out new investigations, and I shall not burden you with my own opinions in regard to it. The great question at present to be settled is, whether we are about discovering the ultimate cause of many hitherto obscure pathological states, or whether these microbes are only bacteria of health taking advantage of diminished vitality to develop with increased rapidity—*whether they are the cause or the scavengers of disease.*—*Medical Record.*

PREVENTION OF DIPHTHERIA, SCARLET FEVER, MEASLES, CHOLERA, SMALL-POX, AND OTHER CONTAGIOUS OR INFECTIOUS DISEASES.*

By J. H. RAYMOND, M.D., Commissioner of Health of the City of Brooklyn.

DIPHTHERIA, scarlet fever, measles, and small-pox are highly contagious diseases, attacking persons of all ages, and may be contracted from those who are already affected, from the clothes that they have worn, and from everything which has been in the room with them. The infection clings to the body even after death, and these diseases may therefore be contracted from the bodies of those who have died with them. Even the walls of the room may be a source of infection to persons coming into it after the patient has left it, unless the infectious material is destroyed. In order to prevent the spread of these diseases in a family or house where they exist, and to promote the recovery of the sick, the following simple measures should be conscientiously and rigidly carried out, thereby preventing much suffering and saving human life.

An upper, sunny room, provided if possible with an open fire-place, and with no children on the same floor, should be arranged for the patient by removing everything from it which can possibly be spared, such as books, clothing, carpets, upholstered furniture, and window curtains; also plants, birds, and other pets, remembering that when once the patient has entered the room, nothing can with safety be removed until disinfected. By thus stripping the room of all articles except those absolutely necessary, the subsequent disinfection is much more easily performed. If it is deemed necessary, a few small rugs will take the place of the carpet.

The fire-place serves a double purpose—first, as a means of ventilation; and, second, by keeping a small fire burning therein, when the weather will permit. The pieces of soft muslin or other material, which should always be used instead of towels or handkerchiefs in wiping the secretion, from the mouth or noses especially in diphtheria, can readily be destroyed by fire, and thus contagion by their means prevented.

One or two adults should take the entire charge of the patient, under no circumstances coming in contact with other persons, especially children. Kissing and "taking the breath" of persons having contagious diseases are especially dangerous, and should always be avoided. Open windows and open fire-places, with fire in them day and night, avoiding draughts and chilly air, protect the sick and those who nurse them.

Nothing should be removed from the room when the

patient has once entered it, until it has been thoroughly disinfected.

Books, scrap-books, toys, or other playthings should always be destroyed at the termination of the sickness, as being undoubted carriers of contagion. Locks of hair and other keepsakes have also been known to spread contagion.

Nurses should keep themselves and their patients as clean as possible, remembering that the more the infection accumulates, the more dangerous does it become. Special care should be taken, in changing sheets and clothing, not to shake them or disturb them more than is absolutely necessary to remove them; as these acts disseminate the particles of skin which are removed with them, and which convey the germs of disease, they should be removed carefully and folded together and immediately disinfected.

DISINFECTION.

It is a popular idea that anything which destroys an offensive odor is a disinfectant. This is not only erroneous, but harmful, as reliance is thus placed on substances that in no wise act as destroyers of infectious material, which latter substances are the only true disinfectants. The methods recommended in this circular are, to a considerable extent, based upon the results of the work of the Committee on Disinfectants of the American Public Health Association.

DISINFECTANTS.

The agents recommended herein for disinfection are:

1. Fire.
2. Boiling water.
3. Chloride of lime or chlorinated lime, either dry or in solution as standard solution No. 1.
4. Solution of chlorinated soda, diluted as standard solution No. 3.
5. Sulphur.
6. Bichloride of mercury.

Bichloride of mercury, or corrosive sublimate, a powerful disinfectant, is included in the above list for one purpose only; that is, for the disinfection of privy-vaults which contain a large amount of material believed to be infected. As this circular is intended for general distribution, the writer hesitates to recommend for general use an agent which may, through improper use, endanger life.

Fire.—As already directed, the materials used in wiping away the discharges of the sick may be burned in the open fireplace, if such there be. In general, this method of disposal is to be recommended for all substances which have been exposed to infection, which cannot be treated with boiling water, and, could it be carried out in all cases, would make disinfection a very simple matter. If it is desired to burn substances suspected of being infected, and there is no fire in the room, such substances may be wrapped in a sheet soaked with standard solution No. 3, hereafter referred to, and in this condition conveyed to the fire in the furnace or elsewhere.

Boiling Water.—Experiment has demonstrated that boiling in water for half an hour will destroy the vitality of all known disease germs. This is therefore recommended as the best means to be employed in the disinfection of all articles which can be thus treated, such as the body clothing of the patient, the bed-clothes, towels, etc. All utensils which are used in the room in the feeding of the patient, such as plates, tumblers, spoons, knives, forks, etc., should likewise be treated with boiling water before being removed from the room. Food itself, not consumed by the patient, should not be used by others, as it is liable to become infected in the sick room.

If, as will often be the case, there are no facilities for treating articles with boiling water in the sick room, they may with safety be removed to another part of the house for this treatment if they are carefully enveloped in a towel or sheet, as the case may require, which has been thoroughly soaked with either standard solution No. 1 or standard solution No. 3. Thus enveloped they should be put in the water, and boiled for the required time.

Chloride of Lime.—This substance, also called Chlorinated Lime, to be effective as a disinfectant must be of the best quality, and in purchasing it, only that should be accepted which is inclosed in glass bottles, as, when packed in paper or wooden boxes, it is liable to have so deteriorated as to be worthless for disinfecting purposes. When dissolved in water, in the proportion of four ounces to the gallon, it forms the standard solution No. 1, recommended by the Committee on Disinfectants. The solution thus prepared is to be used in the disinfection of discharges in contagious diseases, especially in typhoid fever and cholera. One pint should be well mixed with each discharge; after ten minutes disinfection is completed, and the contents of the vessel may be then safely thrown into the privy vault or water closet. The expectorated matter of those sick with consumption should be discharged into a cup half filled with this solution or with standard solution No. 3.

To thoroughly disinfect a privy vault containing but a small amount of material, standard solution No. 1 should be used in the proportion of one gallon for each gallon of material in the vault. When thus disinfected, the contents should be removed. Subsequently, the material in the vault should be daily covered with the dry chloride of lime. It is only necessary to employ this large quantity in solution when there is reason to believe that the vault is infected, as with cholera or typhoid fever; when it is desired simply to deodorize it, a less quantity will probably accomplish the purpose. The cost of the solution No. 1 is about three cents a gallon.

Solution of Chlorinated Soda.—To be effective, this solution must contain at least three per cent. of available chlorine, and in purchasing it care should be exercised to obtain such a quality. This is sometimes spoken of as Labarraque's solution; but, as this latter substance is too weak to act as a disinfectant, the name is liable to mislead, and is therefore here not used. The standard solution No. 3, of the committee, is made by adding five parts of water to one part of the solution of chlorinated soda. The cost of this solution is about ten cents a gallon. When thus diluted it may be used for all the purposes for which standard solution No. 1 was recommended, and is of a somewhat more agreeable odor, though more expensive.

This solution should be used to cleanse portions of

* Issued by the Department of Health of Brooklyn, N. Y.

the body soiled with discharges of those sick with infectious diseases, or the hands of attendants similarly soiled.

Bichloride of Mercury (corrosive sublimate) is recommended in this circular to be used only in the disinfection of privy vaults which contain so much material, believed to be infected with the germs of typhoid fever or cholera, that the disinfection by chloride of lime would be impracticable. In using this it should be dissolved in the proportion of one ounce of bichloride of mercury to one gallon of water; this quantity will disinfect four gallons of infected excremental matter.

TREATMENT OF THE BODY OF THE PATIENT AFTER RECOVERY OR DEATH.

When the patient has recovered, he should be first sponged over with the solution of chlorinated soda, diluted in the proportion of one part to twenty parts of water; and, indeed, during the course of the illness occasional sponging of the body with this very dilute solution, under the direction of the attending physician, will be of value in preventing the escape from the surface of the body of infectious material. When, after recovery, the body has been thus sponged, not omitting the head and hair, a thorough washing of the body with soap and warm water should follow, and the patient dressed in clothes which have not been exposed to infection. This should take place in another room than the one occupied during the illness.

Should the case result fatally, the body should be thoroughly sponged with either standard solution No. 1 or No. 3, and then wrapped completely in a sheet saturated with one of these solutions, and inclosed in a coffin, which is to be closed, and the interment must take place within twenty-four hours, and be strictly private. If the interment is to take place at a distance requiring transportation by any other means than a hearse, the coffin must be of metal, or metal-lined, and hermetically sealed.

DISINFECTION OF THE CLOTHING AFTER RECOVERY OR DEATH.

The clothing of the patient should be treated in the manner already described as necessary during the sickness. Whatever can be boiled in water should be thus disinfected; articles which cannot be boiled should, if circumstances will permit, be burned; all other articles should be left in the room to be subjected to the fumigation hereafter to be described, and until thus treated, the room and its contents should be closed with lock and key, to prevent any one from entering. If it is desired to burn any articles, and facilities for it do not exist in the house, the Department of Health should be notified, and an officer will call and remove the articles for destruction.

DISINFECTION OF ROOM AND CONTENTS.

The room, having been vacated by the patient, should first be fumigated by burning sulphur. This fumigation should be done under the supervision of the physician or some other intelligent person. Upon application, it will be done by the Department of Health. Nothing should be removed from the room until this is completed, unless it has been disinfected in the manner already described. Everything to be fumigated should be so opened and exposed that the sulphur fumes can come in contact with all portions thereof. All cracks of doors and windows, fire places, or other channels by which the gas may escape should be tightly closed, using cotton wadding when necessary. For a room ten feet in all its dimensions—that is, one containing one thousand cubic feet of air space—two pounds of broken sulphur and one pound of flowers of sulphur should be provided, and an increased amount for larger rooms, in the same proportion.

This quantity is important, as less will not so efficiently accomplish the desired disinfection. The sulphur should be put in an iron pot, and this placed on bricks in a large washtub half filled with water, or in a large coal-scuttle containing wet ashes. This precaution is necessary to prevent setting fire to the floor, which would occur if the pot were placed directly on the floor or carpet. The vessel containing the sulphur should not be one with soldered joints, as the intense heat would melt the solder. A pot capable of holding one gallon is about the right capacity for three pounds of sulphur. The pot should be placed in the center of the room; if the room is a large one, containing several thousand cubic feet of air space, several pots should be provided, distributed at different points. Everything being in readiness, sufficient alcohol to moisten the sulphur should be poured on it, a lighted match applied, and when it is seen that the sulphur is well ignited, the room should be left and the door shut, and all cracks outside, including the key-hole, closed by paper, cotton, or other material. At the end of ten hours the fumigation is completed. Great care should be exercised in emptying the room of the sulphur fumes, as these cannot be safely breathed, and are excessively irritating to the eyes and throat. If possible, a window should be opened from the outside, and through this the fumes permitted to escape; if this is impracticable, all the windows and doors of adjoining rooms should be opened, and then the door of the fumigated room, and through these outlets the fumes allowed to find an exit. Thorough airing will remove the slight odor which remains.

The fumigation being completed, all woodwork, as of floors, windows, and door, and the walls and other surfaces should be washed over with standard solution No. 3; particular attention being paid to cracks, crevices, and out of the way places, in which dirt ordinarily finds a lodgment and from which it is with difficulty removed. A subsequent washing with hot water and soap will complete the cleansing process, and the room may be considered again habitable.

ADDITIONAL PREVENTIVE MEASURES TO BE EMPLOYED IN THE ABSENCE, AS WELL AS IN THE PRESENCE, OF CONTAGION.

See the whole house, from cellar to attic, is clean. Keep the cellar dry, well ventilated, and well white-washed, and never allow, even for a day, garbage or other filth to be kept in it.

Open the windows of sleeping rooms every day for as long a time as possible, and in every way obtain as much fresh air as possible.

Abolish the privy in the yard if there is a sewer in the street, and substitute a well-flushed water closet; if there is no sewer, see that the vault is water-tight, emptied frequently, and kept inoffensive and innocuous by the abundant use of the standard solution No. 1, previously referred to, and subsequently sprinkling the dry chloride of lime freely over the surface of the contents daily.

Be sure that there are no leaks or defective traps or joints in the drain-pipes of the house, through which the gases from the decomposing filth contained therein can enter to pollute the air you breathe.

Should there at any time be any suspicion cast upon the drinking water, as when citizens are away from home, the drinking water should be boiled; this is to be rigidly carried out in epidemics of typhoid fever or cholera.

Unripe or stale fruit and vegetables, and those of difficult digestion, should be avoided at all times, particularly during the prevalence of cholera.

When the children complain of sore throat, send promptly for a physician; a few hours' delay may cost their lives. If the disease is pronounced contagious, see that it is reported at once to the Department of Health, and keep the other children from schools of all kinds until a permit is procured for their return. Members of the family should not attend social or other gatherings so long as the disease continues. Keep the patient and the attendants quarantined from other members of the family and house.

School permits will be given, on application, by the inspector, as soon as the patient has fully recovered and the sick-room has been disinfected; in cases of scarlatina and measles, this will not be until desquamation—or peeling off of the skin—is completed.

The measures here recommended are to be used in all contagious diseases, whether diphtheria, scarlet fever, measles, small-pox, or others.

ELECTRIC WATER-LEVEL INDICATOR.

AMONG the most curious apparatus of the Exhibition of Electricity at the Paris Observatory last April,

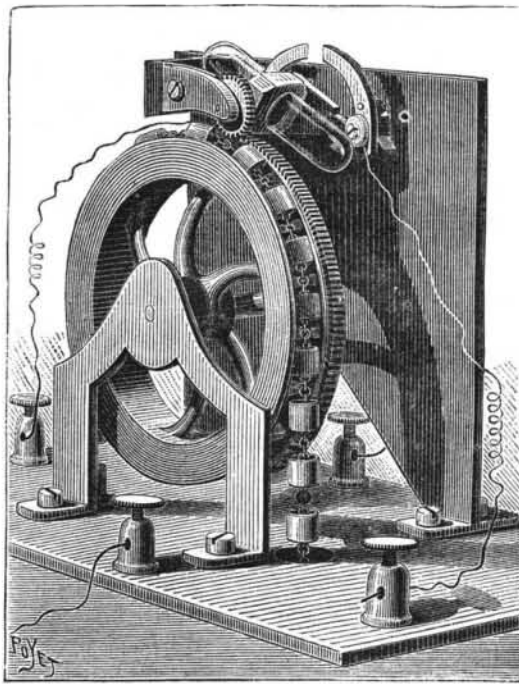


FIG. 2.—TRANSMITTER.

there figured an electric apparatus for indicating and registering the level of water to a distance. This apparatus, which was invented by Mr. Parenthou, is now in service at the reservoirs of the city of Paris.

The system is so established as to employ but a single line wire, the earth serving as a return one. The indications are given both upon a dial and an ordinary registering cylinder driven by clockwork through the transmission of the positive and negative currents, according as the level of the water in the reservoir rises or falls.

The transmitter (Fig. 2) consists of a float (not shown in the figure) suspended from a chain formed of a series of small cylinders. This chain passes over a pulley, whose channel has an appropriate form, and its other extremity descends to the bottom of the reservoir. According as the level rises or falls, the float carries along the chain, and the latter revolves the pulley in one direction or the other. When, for example, the float rises, the little cylinders become superposed

and diminish the weight of the chain on the side at which it is elongated, and the contrary occurs when the level falls in the reservoir. In this way there is obtained an always perfectly balanced system, whatever be the water's level. The wheel that supports the chain carries along with it, in its revolutions, a gearing and an axle. Upon this latter is mounted a glass tube that contains a certain quantity of mercury, which, by its own weight, keeps the tube always vertical; and the circuit opens through a combination of electric contacts. In turning in one direction or other, the tube is given a quarter revolution through a simple mechanical arrangement, not shown in the figure, and, as soon as it has got slightly beyond a horizontal position, the mercury flows to the other end and makes it quickly accomplish the rest of its half-revolution. It is in this second quarter-revolution that is established the electric contact which sends a positive current, if the revolution of the wheel corresponds to a rise of the water, and a negative one, if the revolution is produced by a fall. At each revolution of the axle, then, two emissions of the current occur.

By combining the respective diameters of the wheels, we can make each current emission occur for a difference of 5, 10, 20, 50, or 100 millimeters, according to need. The arrangement adopted by Mr. Parenthou secures one contact, and one only, for each variation of level unit for which the apparatus has been established. The transmitter, then, finally translates the variations of level by positive or negative current emissions according as the level rises or falls.

These currents are sent into a polarized relay, whose armature is attracted to the right when the relay is traversed by a positive current, and to the left when the current is negative. These motions of the armature are utilized for sending currents into the electro to the right or left of the receiver (shown in Fig. 2), by closing the circuit of a local pile. The action of one of these electros causes the needle to move in one direction, and that of the other makes it move in the opposite direction.

Mr. Parenthou has devised a very ingenious arrangement for making the mechanical action that moves the needle independent of the intensity of the current furnished by the local pile. To this effect, the axis of the needles carries two wheels toothed in opposite directions, upon each of which acts a click that corresponds to each of the electros. This click is fixed upon a horizontal lever, which is lifted by an iron cylinder that rests upon one of its extremities, and moves freely in the bobbin of the electro, which acts here as a solenoid. When a current is passing, the iron core is moved, and the lever, which is no longer held by the weight of the iron cylinder, falls back with a constant force, and causes the wheel to move forward one tooth.

When the current ceases to pass, the cylinder falls back, and replaces the click and lever in a position to await another emission of the current. The idea is excellent, and the application of it is recommended in a goodly number of cases where it is necessary to obtain a constant mechanical effect with a variable force. The revolution of the needle's axis in one direction or the other carries along a horizontal rack, at whose extremity there is a style that moves in front of a horizontal cylinder covered with paper and driven by clockwork. In this way one obtains at a glance a representation of the state of the level in the reservoir at any moment.—*La Nature*.

QUIESCENT MERCURY FOR AMALGAMATION.

A NEW idea in amalgamation is that of overcoming the disturbing effects of a current caused by the rising of ore through mercury by allowing the mercury to remain for a sufficient time in a state of quiescence for complete amalgamation to take place, or for the operation of gravity, while at the same time a continuous operation is carried on. In most cases where a mass of mercury is used, the amalgam, or amalgamated particles of the triturated ore, are, to a greater or less extent, carried upward by the currents, together with the lighter particles. Abel H. Bliss, of Chicago, has produced an appliance founded upon the hypothesis that separation can be most effectually attained by combined action of amalgamation and gravity, the latter being assisted by a downward current in the mercury while the ore is passing upward.

These actions are still further assisted by the retention of the ore beneath a body of mercury by stopping its upward passage for a brief time, giving the particles of a superior specific gravity time to descend, and giving amalgamation time to act. That is to say, according to the argument of the inventor, if a body of ore reduced to a finely divided state is allowed to pass into a chamber containing mercury in a state of quiescence, and is caused to remain there for a brief period and then is allowed to pass into a tray of mercury or another chamber above the first, a portion of mercury in the upper chamber simply changes place with the ore rising from the lower chamber, producing a downward

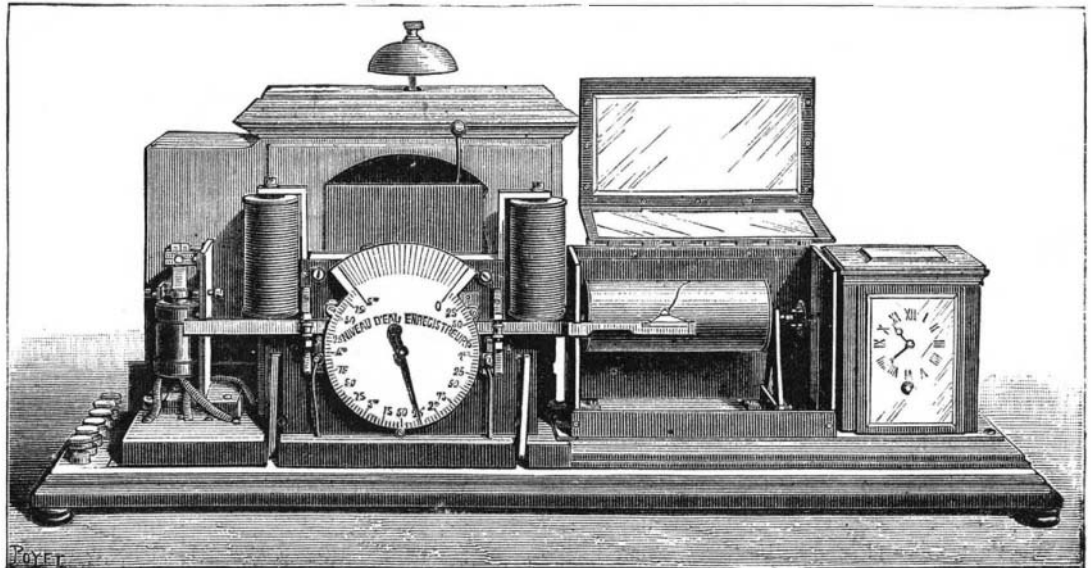


FIG. 1.—ELECTRIC WATER LEVEL INDICATOR.—RECEIVER.