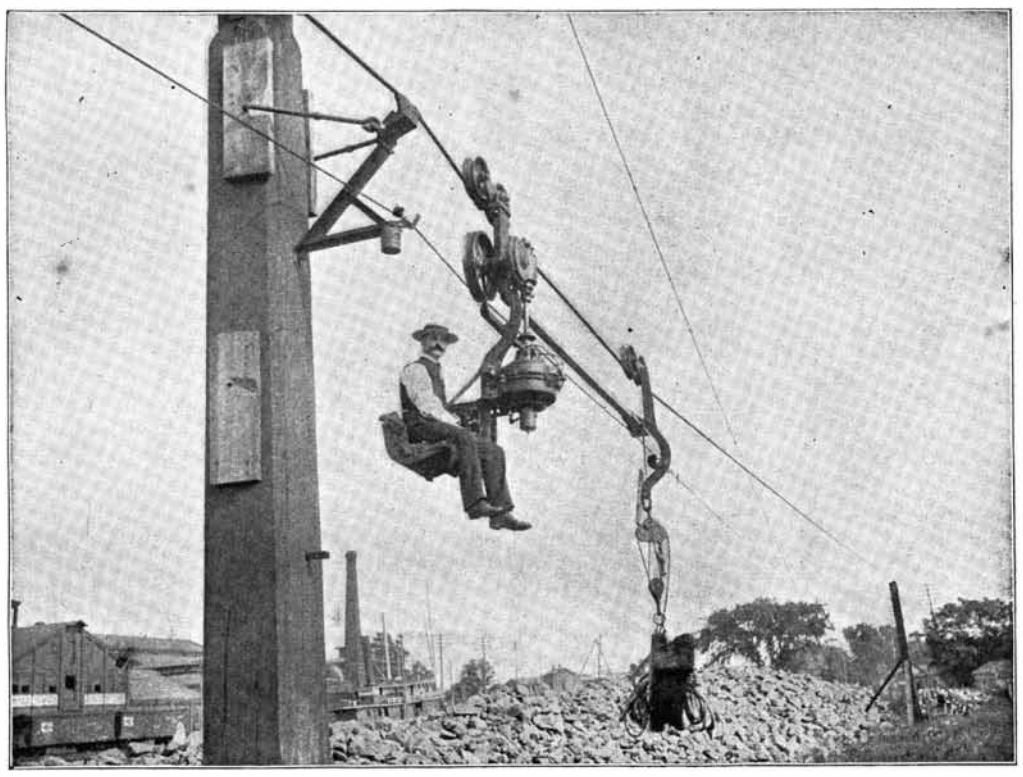
The Electric Coherer.

The Electrical Review, London, in speaking of Dr. Oliver Lodge's new instrument for detecting Hertzian oscillations, has the following:

"Prof. Oliver Lodge is a worthy continuator of the epoch-making work of the great Hertz. In his recent lecture at the Royal Institution he showed some interesting electric wave experiments with apparatus of remarkable simplicity and sensitiveness. As he remarked, 'the detector for Hertz waves might have been used in the last century; it might have been used by Benjamin Franklin.' The instrument which Dr. Lodge has devised for detecting electric waves he calls a coherer. It may be described as an electric welder on a very small scale, the electric welding being effected by the exceedingly minute currents produced at the contact of two pieces of metal by Hertz waves. Lodge had observed, in 1889, that two knobs, so close together that the air gap was unable to stand any such voltage as an electroscope can show, would actually cohere when a spark passed between them. The joint thus welded was capable of conducting an ordinary bell-ringing current if a single voltaic cell was in circuit, and required a perceptible amount of force to separate it. This arrangement has been developed by Lodge into an extremely sensitive wave detector. One terminal of an electric circuit, containing a single voltaic cell and a moderately sensitive galvanometer, consists of an iron wire which rests lightly on an iron plate attached to the other terminal. The instrument is most sensitive when the contact is sufficiently good to allow a very small current to pass. If electric waves are produced, say by charging and discharging an insulated sphere at some distance, the insulating layer at the contact of the coherer breaks down, and a considerable deflection is shown on the galvanometer. With this simple apparatus the reflection, refraction, polarization, and other optical properties of electric waves can be readily demonstrated. Electric oscillations in a sphere sixty yards distant have been indicated, and Dr. Lodge estimates that they would be detected half a mile away. The sensitiveness of the contact can be restored by tapping the plate.

"On these phenomena Dr. Lodge has founded an ingenious theory of vision. The retina of the eye is supposed to be furnished with cohesive contacts which allow an electric current to flow in the nerves when acted upon by the electromagnetic waves of light. Mechanical vibration supplied by the tissues restores the sensitiveness of the contact at intervals of a tenth of a second. A model has been constructed by Dr. Lodge to illustrate this theory. An electric bell or other mechanical vibrator is mounted on the same board as a tube of filings, which in this case acts as a detector, and has its sensitiveness restored by the vibrations of the bell. This apparatus can be arranged so that a feeble electric stimulus produces a feeble, steady effect, and a stronger stimulus a stronger effect.

"The coherer is more sensitive to short waves than to long. The sparking at the contacts of an electric gas lighter will produce a marked effect, while heavy sparks from a large influence machine will not affect the instrument. Like the eye, the coherer has a limited range of wave lengths. This field of investigation promises results of great theoretical interest at least. Whether electric oscillations of these extremely high frequencies are ever to have any technical application is doubtful. The experiments of Tesla and others in this direction have not been promising."



ELECTRIC CABLEWAY.

STEAM AND ELECTRIC CABLEWAY FOR LOGGING AND CANAL BOAT TOWING.

Considering the fact that there is in this and other countries great wealth of swamp forests heretofore unavailable, it is surprising that some one has not devised a practical system for logging swamps before this date. With the exception of two systems, which are only available for short distances, no appliance has been invented until Richard Lamb, of New York, designed and put into practical use his steam logging system.

As the total area of forest to be cleared at any one setting would not require much time, the system had to be designed to be easily removed from place to place. Trees had to be used as supports, as they are the only foundation to be found in a swamp. Naturally any steam logging system has to be worked in practically a straight line. To attempt to find trees in a straight line would be difficult if the distance apart was not great; but it was found that in a forest of ordinary density a practically straight line could be got with trees from 100 to 225 feet apart; consequently this system was designed for long spans.

Iron brackets are put upon trees or timber uprights. The endless steel hauling cable is suspended by the snatch-block and swinging sheaves on the brackets, and is made to pass around a large metallic sheave on the tailtree. Two or three turns of this cable are taken around an elliptically grooved sheave. This sheave is run by an engine having one lever, which regulates the speed, reverses the engine, and shuts and opens the throttle valve.

The bearing cable is hauled out in sections by the endless cable and joined together by patent couplings, over which the cars pass without interference.

The cars have grooved wheels to run upon the bearing cable, with a hanging arm, to which the hauling cable is attached. A metallic tackle block, having a grip to sustain the load, is hung from the hanging arm. By confining the end of the rope and moving the car, the log, which is attached by tongs to the lower block, is raised and is held suspended until it is desired to lower same, when the grip is released and the log falls.

Logs are hauled in from either side up to the bearing cable by a cable which is attached by tongs to the log. This cable is passed through a sheave, placed as high up a tree, near the cable, as the stiffness of the tree will admit, thence through a sheave attached to the same tree at the same elevation as the bearing cable. A strut is placed between the tree and the bearing cable, and a sheave is attached at the

ELECTRIC CABLEWAY FOR LOGGING.

intersection of the strut and the cable, through which the lateral hauling rope is passed. By attaching the end of the rope to a car and hauling it on the same, the log is pulled in to the main cable.

For distances up to one half mile this steam cableway is very serviceable. The system has been in actual operation in a swamp in North Carolina for the past six months.

One of our engravings is from a photograph taken from the apparatus in actual use in the swamp. It illustrates very clearly how the load is supported by the bearing cable, and shows the method of attaching the trolleys to the logs.

To extend the system further into the swamps, Mr. Lamb has substituted electricity for steam, and instead of having an endless hauling cable he uses the same size cable a single length instead of a double length. This cable is passed around an elliptically grooved wheel on a car or locomotive, which is revolved by an electric motor on the same; thus the power is transferred to points on the line where work is to be done, instead of being always at the end, as in the case of the steam cableway. By means of a false saddle on the tree bracket, on which the traction cable rests, the line can be run in right or left curves, obviating all trouble in regard to alignment. The same method is employed for hauling logs up to the cable from either side of same as is used with the steam cableway.

As will be observed in one of the engravings, the operator can ride with the electric locomotive, controlling all its movements by a rheostat and switches near at hand.

This electric cableway can be used for a number of purposes, one of the most valuable of which is canal boat towing. This has been tried practically and has proved very effective.

In canal boat service, the towing hawser contains insulated wires. This cable is rigidly attached to an eye bolt, just below the point of insulation on the hanging frame, and from the end of the rope the various wires are connected with their respective connections. The bite of the rope is connected with a clamp made of non-conducting material; the socket of this clamp, and the pin which engages in it, which contains the wires leading to the reversing switch and rehostat, is made irregular in shape, so that corresponding wires are obliged to come in contact when the clamp is connected.

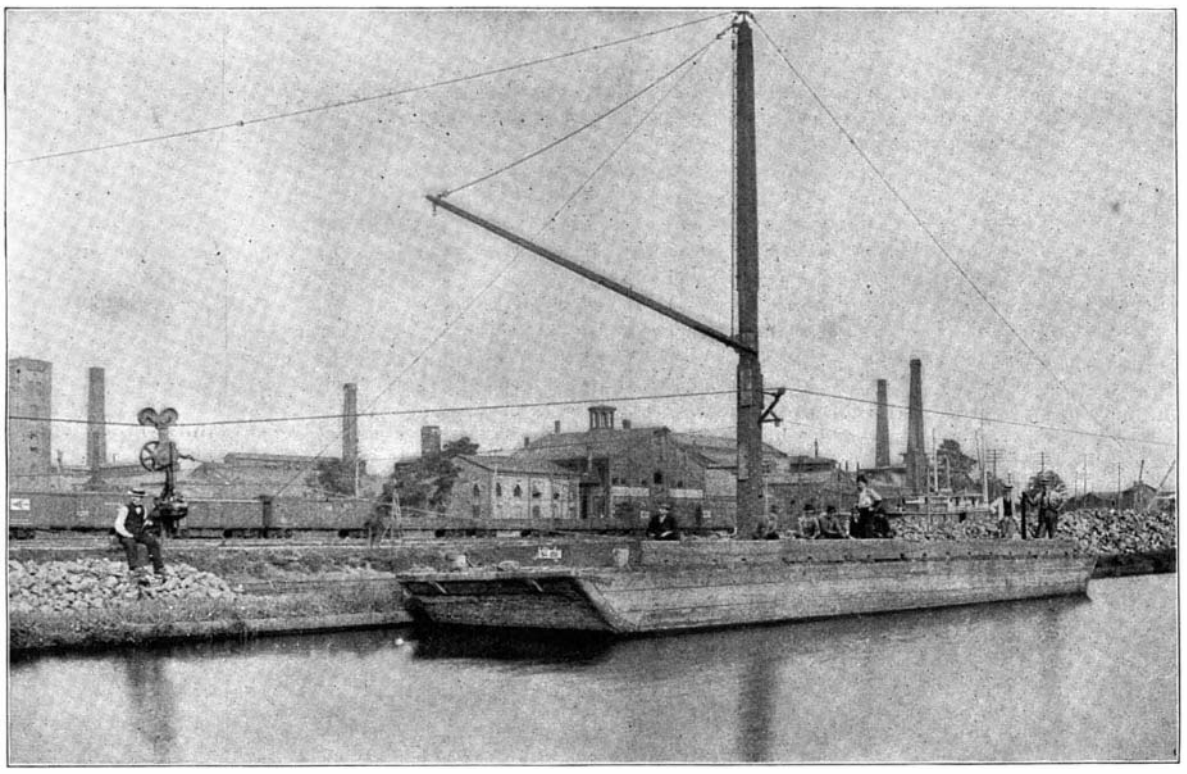
In operating, a canal boat will apply for a motor. If the boat does not own a rheostat, one will be placed on board. The towing rope will be attached to the sampson post, leaving the end of the rope free. The wires in the tow line will be connected with their respective wires in the rheostat by the clamp as desired, and the boat proceeds.

On approaching another boat coming in the opposite direction, motors are stopped, cables are disconnected, and boats exchange cables, and consequently motors, and proceed. Of course, an extra cable, one above the other, or one on each bank, would obviate the necessity of exchanging motors.

The trial plant illustrated is operated with a 15 k. w. Edison dynamo, at 220 volts. The motor is 5 k. w. Lundell, provided with a metal bonnet to protect it from rain, but which is not shown in the illustration. The large scow shown is gotten under way quickly. Boats can be pulled at the rate of six miles per hour with the motor now made.

An early adoption of this system of canal propulsion seems feasible and desirable.

Further particulars in regard to this system may be obtained by addressing Mr. Richard Lamb, 1 Broadway, New York City.



CANAL TOWING BY ELECTRICITY.

Advantages of New Bread.

New bread and the hot morning roll have been condemned as injurious and difficult of digestion. However true this charge may be, the use of new bread appears, even from the hygienic point of view, to have some compensating advantages. Dr. Troitzki, writing in the Russian medical periodical Vratch, states that he has found that new and uncut bread contains no micro-organisms, as the heat necessary to bake the bread is sufficient to kill them all. As soon, however, as the bread is cut and is allowed to lie about uncovered, not only harmless but pathogenic microbes find in it an excellent nutrient medium. White or wheat meal bread is a better medium than black or rye bread, as the latter contains a greater percentage of acidity. Dr. Troitzki's experiments with the pathogenic bacteria, says the British Medical Journal, gave the following results:

Streptococcus pyogenes aureus retains its vitality on the crumb of wheat meal bread for 23 days; the bacillus of anthrax (without spores) remains alive on the crumb for 30 to 37 days, and the crust for 31 to 33 days; the typhoid bacillus remains active 25 to 30 days on the crumb, and 26 to 28 on the crust; while the bacillus of cholera lives 27 days on both. Of special interest is the fact that if the bread is placed before the experiment for fifteen minutes in the disinfecting oven (at a temperature of 115 degrees C.) all of the above named pathogenic bacteria retain their vitality for several (4 to 8) days longer. The author explains this fact by the acidity of the bread being lessened by the heat and the bread becoming a better nutrient medium.

Raising a Bridge.

The raising of a bridge in Switzerland upon the line of the International Railway, from Paris to Vienna, has attracted considerable attention from the methods pursued. The occasion for the change, says Locomotive Engineering, was that the river crossed—the Rhine—had lost in the sectional area of the passage between the piers about 25 per cent in thirteen years, owing to the deposition of gravel and sediment, while the high water level had risen to such an extent as to pile floating debris six feet deep on the bridge floor in times of flood. The alterations included some re-enforcements, besides the raising of the whole structure about five feet.

The bridge was continuous over a central pier, and had two main vertical posts there and four vertical end posts. To each of these posts an inclined strut was attached in a transverse vertical plane, presenting a surface for the top of a hydraulic jack to act upon. Eight special 100 ton jacks were used, with an 8 inch stroke and a working pressure of 400 atmospheres, the piston being nearly 0·7 in diameter. The fluid used was a mixture of water, alcohol and glycerine. Sixteen men operated the jacks, their movements being synchronized by a code of signals, designed to secure uniformity of action. The bridge was raised a foot or two by short lifts, followed by thoroughly blocking, and then building under one course of cut stone masonry. The total load was 546 tons, and the maximum load on a single jack was 87 tons. The bridge was raised in four stages during intervals between trains. The longest interval between trains was about two hours. The weight of trains was rigidly restricted during the time the bridge was undergoing repairs, and their speed was limited to three miles an hour in crossing the bridge. In addition, a special block system was organized upon that section of the line upon which the bridge is located, so that operations could be suspended, and the track restored five minutes before the arrival of a train at the site.

IN 1890 the railroads of the world were estimated at 370,281 miles.

Pneumatic Gun Tests.

A number of pneumatic gun tests have been recently held at Sandy Hook. Probably the most interesting of these trials was an acceptance test of the Ordnance Board, which took place August 21. The battery consists of two 15-inch and one 8-inch pneumatic guns, constructed by the Pneumatic Torpedo and Construction Company, of New York. The boiler capacity of the plant is four hundred horse power. The air is stored in accumulators after being compressed; there is a firing reservoir for each gun. The 15-inch guns weigh, with the carriages, fifty-two tons, and are set in a depressed foundation. The guns are trained by electricity, and the range is determined partly by elevation, as in the ordinary field piece or rifle, and partly by the variation in pressure, which can be regulated with ease. The operator stands on a platform fastened to the gun, and the entire gun can be revolved in fifty-two seconds. When the shot is fired a low, hissing sound is heard at first, followed by a deafening report. The projectiles can be seen as soon as they leave the muzzle. The pneumatic guns at Sandy Hook can drop 500 pounds of high explosive into the Main, Swash and East channels through which all vessels of any size must pass to enter New York harbor. The pneumatic guns are surprisingly accurate, 96 per cent of the shots being what are known as bull's eye shots, which is a remarkable showing.

After some preliminary shots two heavy charges were fired. The first was a 10-inch subcaliber projectile charged with two hundred pounds of explosive composed of 87 per cent of nitroglycerine, 7 per cent of guncotton, 4 per cent of magnesia and 2 per cent of camphor. The fuse was set to act on impact. As the projectile struck the water the spectators saw an enormous column of water like a huge geyser, projected up hundreds of feet into the air; a few seconds later a penetrating report was heard. In the final round a full caliber 15-inch projectile charged with 500 pounds of the high explosive described above was fired with a fuse set to explode the shell two seconds after impact with the water, to avoid breaking the glass in the lighthouse windows. The range was about 2,500 yards. The fuse delayed the explosion one-quarter of a second; the ocean for a radius of fifty feet rose in a solid column. The plant is capable of supplying the compressed air consumed on the entire five rounds in ten minutes. It is not claimed by the builders of this gun that it will revolutionize the art of war, but they do claim it to be an effective weapon for short and medium ranges, not over three and one-half miles, and certainly the results of the recent tests have amply demonstrated the reliability and accuracy of the gun.

An Electrically Heated Quilt.

A new invention, called by its inventor the thermogen, consists of a quilt containing a coil of wire bent in the fashion of a gridiron, inclosed in insulating and non-conducting material, and embedded in cotton wool or other soft substance with a silk or woolen covering. The resistance offered by the coil to the flow of an electric current through the wire produces heat in the same way that heat and eventually light are produced in the filament of the glow lamp. A uniform temperature of about 150° Fah. is thus maintained, but in the event of the temperature rising beyond that point from increase of pressure in the electric mains, a fuse instantly melts and automatically shuts off the current. The quilt may be readily attached to ordinary incandescent lamp terminals. In describing this device the Lancet says that the most important medical use of such an invention would be on the operating table, where, in lengthened operations or in those attended with hemorrhage, where artificial means to sustain the patient's temperature are required, blankets and hot water are a decided nuisance. In such cases this quilt would be invaluable as a soft, dry, warm, and convenient covering. Again, in cases of chronic rheumatism, lumbago, or senile slowness of circulation, such an appliance would be useful. The thermogen is now on trial in several English hospitals.

The Physical Basis of Knowledge.

The surface of the brain has many centers upon it whose functions have been carefully studied. In addition to these centers, there are tracts of nerve matter connecting them with each other, so that an associated or concerted acting of the brain centers becomes possible—indeed, is of constant occurrence. One hears the word "rose" spoken, and immediately the image of a rose is recalled; there is a recollection of its odor, of its color, of its size and shape, and a stimulus goes to the proper centers, so that the word "rose" may be spoken or written, if it is so willed. It is these tracts or paths of nerve matter that enable the brain to build up our complex ideas. It will be seen from what has been said that the word "rose" carries with it many elements, such as color and shape, learned by experience through the eyes; taste, by the tongue; odor, by the nose; weight, by the hands. But all these qualities of taste, color, odor, weight, etc., go to make up our complex idea of what a rose is. These varied primary or elemental ideas have reached the brain by separate channels, have formed memory pictures on the centers, which, in turn, have become associated by means of the intercentral nerve paths into complex ideas.

In addition to the impressions reaching the brain through the nerves of hearing, sight, taste, and olfaction, there is a constant stream of sensations pouring into the brain along the nerves of feeling. It has now been pretty well settled that some of the nerve fibers conduct sensations of heat, others of cold, some of pain and still others that sensation known as muscular effort, or the muscular sense. All these are carried to different parts of the brain and there registered. From this registry they can be called up as a memory of past experiences. It will now be clear that there is a constant stream of sensory currents or sensations coming into the brain from all parts of our bodies. These sensations have their mental accompaniment. When a current escapes from the brain, and goes outward for the purpose of moving some muscle or group of muscles, there is also a mental accompaniment. It is in this way that we are aware of how we are acting and being acted upon. These constitute states of consciousness. The conscious personality, or conscious ego, is the sum of all the states of consciousness at one time existing.

In a moment, by disease or injury, a man may lose the power to speak, and yet be able to read and write; or he may be unable to read, and yet hear what is said Some may have the center of hearing so damaged that the power for music is gone and still be sound in every other respect. Some, again, may lose the power of recalling words. They know them when written or printed; but they cannot speak, because they cannot recall the words needed to express their thoughts. Enough has been said to show that the brain and all the nerve tracts leading to it and from it are the physical basis of knowledge. Derangement in these is followed by derangement in the mental powers. Insanity is only disease affecting the brain so as to derange and pervert the thoughts, language and actions of the person. This view of insanity has done much good, as it has led to a better method of dealing with insane people. The anatomical and physiological study of the brain shows that it is the organ of the mind; but further observations made in cases of disease and injury of the brain, as well as on cases of insanity, go to establish this doctrine beyond all dispute. Illusions, hallucinations, and delusions owe their origin to some derangement in the sense organs or in the perceptive centers in the brain. Following upon this, the conscious ego is no longer in its true relationship to its environments, and there is, as a consequence, derangement of conduct, as the result of the physical disease.—John Ferguson, M.D., Canadian Magazine.

Dangers of Bicycle Tires.

A dispatch to the New York Herald from Jeffersonville, Ind., August 23, states that while Lyman Parks, twenty years old, son of Prison Director Parks, of that city, was on a trip to Corydon, the tire of his bicycle burst, and with the assistance of another cyclist he inserted a new inner tube and proceeded to pump it full of air.

Parks was bending close over the wheel of his machine, while his companion stood close by looking on. Suddenly there was a report like the discharge of a shotgun. Parks and the other cyclist were knocked off their feet. The tire had burst with violence.

Parks' companion was the first to rise, and found Parks badly injured about the face and completely blinded by the explosion. He took the young man to Corydon, where a physician attended him.

Parks was brought home next morning. He will recover his eyesight, but the injury caused by the concussion might have killed him had he been directly in the line of the flying fragments.

A RECORDING THERMOMETER FOR CLOSED SPACES.

In designing this thermometer the object has been to produce an instrument which would make a continuous record, day and night, of the temperature in heaters, ovens, dry kilns, and such closed spaces, and at the same time permit the recording portion of the apparatus to be located at any convenient point outside of the room or kiln where the temperature is to be measured.

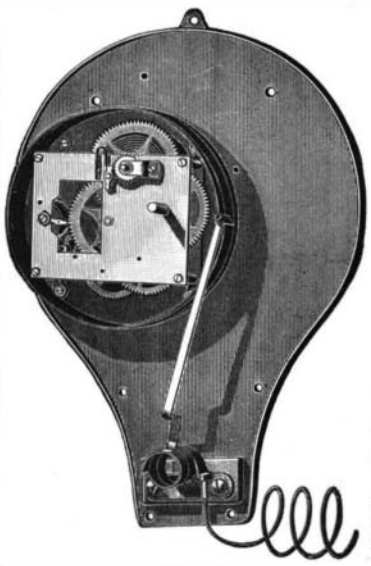


Fig. 2.

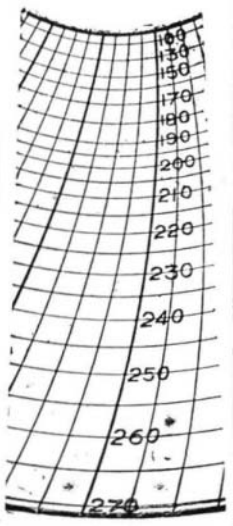


Fig. 3.

The instrument is shown in Fig. 1, set up and ready for operation. The wall of the oven is broken away, showing the coil of pipe, suspended at the point where it is desired to measure the temperature. The recording part of the instrument is shown at the left side of Fig. 1, and is connected to coil D in kiln, or oven, by a small flexible copper tube. Fig. 2 shows the interior of the recording portion of the apparatus, which consists simply of one of Bristol's recording pressure gauges. The coil, D, in the oven is partly filled with alcohol and the remaining air is exhausted. When heat is applied to the coil the vapor of the alcohol condenses and completely fills the pressure gauge tube and the small copper tube leading to it. The pressure due to the temperature of the oven or kiln is transmitted to the recording gauge.

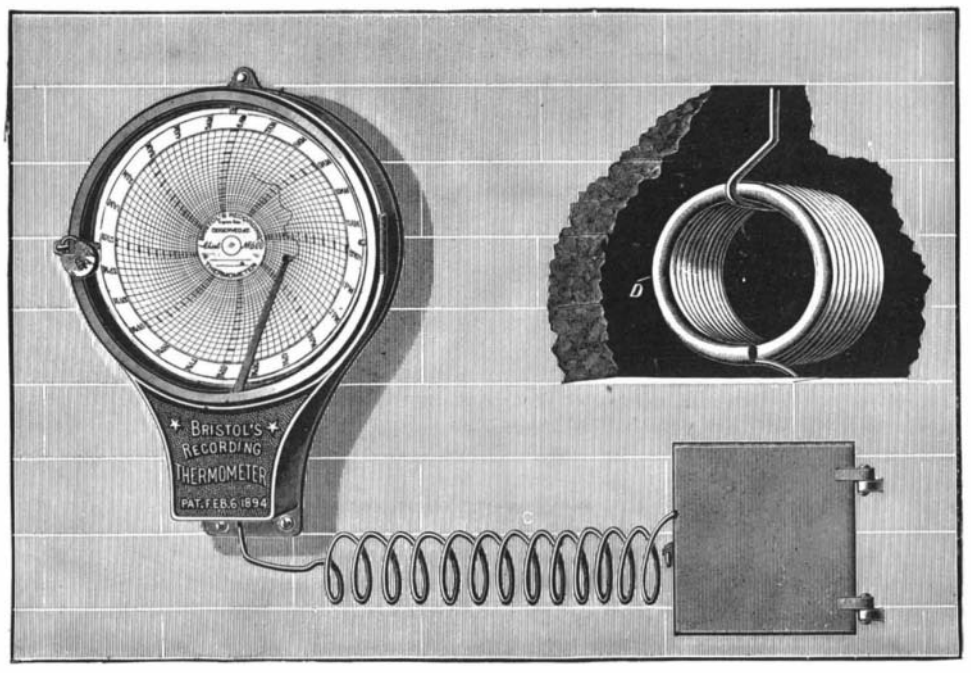


Fig. 1.—A RECORDING THERMOMETER FOR CLOSED SPACES.

The scale on the gauge chart is graduated in degrees Fahrenheit by means of a standard thermometer. The coil, D, is immersed in oil for standardizing in connection with the graduating chart.

There is no compensation required for changes of temperature in the room where the recorder is placed, as the small copper tube is completely filled with alcohol and the pressures due given temperatures are always the same.

Fig. 3 shows a specimen section from chart of one of these thermometers for a range of 270 degrees Fah. It will be observed that between 170 and 270 degrees the scale is very open. A number of these instruments have been in successful operation in rubber works for the past four months, for keeping a record of the temperature in heaters during the process of vulcanizing rubber goods.

These thermometers are being manufactured and placed on the market by the Bristol Company, of Waterbury, Conn.

A working model of this apparatus was exhibited and described at the Brooklyn meeting of the American Association for the Advancement of Science by W. H. Bristol.

Woodwork vs. Flame.

In a London paper is published a letter from Mr. F. H. Gossage, who makes some interesting statements. He says:

"I find that painting woodwork of any kind with several coats of solution of silicate of soda, and finishing with a mixture of this solution and sufficient common whiting to make it about as thick as ordinary paint, is an excellent protection against fire. Wood treated in this way will not take fire from mere contact with flame; it requires to be heated till destructive distillation begins. Then, of course, gases are given out which ignite, and the wood is gradually converted into charcoal, but until destructive distillation takes place the coated wood will not support combustion. A few years since I had some screens made like ordinary doors, some prepared as I have described and some not. They were then placed over a fire of shavings, which was kept constantly renewed. In ten minutes the unprepared screens were blazing away, and so nearly consumed that they had to be supported by an iron bar. The flames continued to lick the prepared screens for thirty minutes before the distillation commenced. After forty-five minutes the coated screens were still intact and able to support themselves; they held together for an hour, although pierced in many places with holes, and when the fire was removed they did not continue to burn. This was a splendid success, and I still have the remains of the screen. The experiments were made at my suggestion for the managers of the Liverpool Philharmonic Society, and the woodwork of their splendid hall at Liverpool was treated in this manner."

Ornamentation of Glass with Aluminum.

M. Charles Margot, of the physical laboratory of the University of Geneva, says L'Industrie, has just made a curious discovery. He has found that by rubbing on glass with an aluminum point we obtain clear metallic lines, which cannot be removed by washing, no matter how often repeated. This property which aluminum possesses, of adhering closely to glass, or in general to any substance having silica as its base, is most plainly shown when the surface is dampened or covered with a very light coat of moisture, as, for instance, when a man breathes upon the surface of the glass. An indispensable condition is that the glass and the aluminum point shall be clean.

M. Margot has arranged a special apparatus for his experiments. He uses a lathe of aluminum, which turns very quickly, and with it he traces designs on the glass. These lines have a bright metallic reflection; polishing with a steel tool gives them the appearance of metallic incrustation. The adherence to the gass is absolute. Without doubt we can, by treatingthe decorated glass with caustic potash or chlorohydric acid, remove the metal, but the design remains. The lines are clearly fixed on the glass, as if the surface had been corroded by the metal.

It is known that magnesium, cadmium, and zinc have similar properties, and that they will leave visible traces on glass. None of these metals, however, possesses this property to the same extent as aluminum, except possibly magnesium. On the other hand, besides the fact that magnesium oxidizes very quickly, the traces which it leaves on glass vanish quickly, and therefore the metal can be used for this purpose only under special circumstances.

Many applications can be suggested for aluminum in this direction. It can be used instead of the engraver's tool in cutting designs on glass. With the aluminum pencil diamonds can be distinguished from imitation, since it will make no mark on a diamond. It is possible that the new discovery may make a great difference in the making of cut or engraved glass.

IT is generally supposed that when a man's heart pulsations go down to 40 a minute death will follow unless restoratives are administered. Parisian doctors are now, it is said, puzzled over a man, in one of the hospitals, whose pulsations have sunk as low as 18 a minute, although to all appearances he is well and strong.