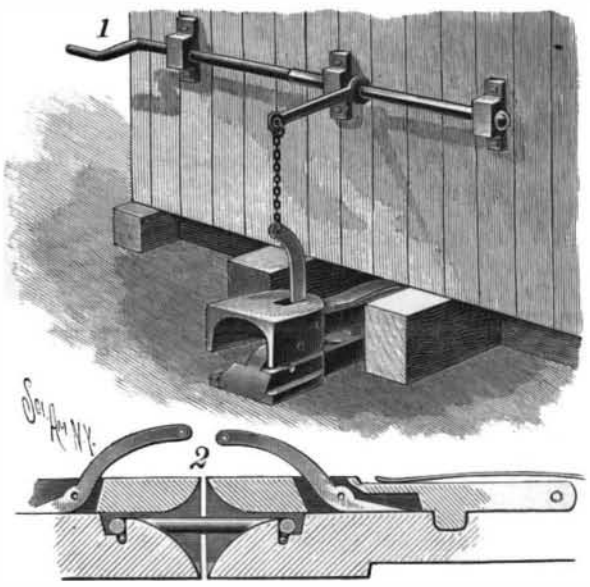
one end, the sulphur being held in a cast iron pan, under slow combustion, to produce the dioxide; and to continue the operation without opening the doors and causing rapid combustion, a double-winged stoker is provided by which additional roll sulphur can be introduced to the pan. The fumes travel through the double furnace to a reservoir on top, provided with baffle plates, and are then sucked by exhaust fan (driven direct by a rapid-speed engine), thence through hose into the building being fumigated, the quantity being regulated by a sliding gate valve. Both these machines embody the same principles described in previous paper, and are intended, in case of infection appearing in a certain quarter, to be driven to the infected house, and after the patient's removal, all bedding, clothing, etc., be disinfected in the steam disinfector, after which the house itself be thoroughly disinfected by the sulphur fumigator.

These machines were designed for the United States Marine Hospital Service by Dr. Walter Wyman, Supervising Surgeon-General, in association with Dr. J. J. Kinyoun, one of the able bacteriologists in the bureau.

AN IMPROVED CAR COUPLING.

The engraving represents a coupler adapted to automatically couple cars as they come together, the uncoupling being readily effected by means of a releasing attachment from the side of the car. Fig. 1 is an end view of a car body on which the improvement is applied, Fig. 2 being a sectional side view of two of the couplings in coupled connection. The drawhead and drawbar are formed in two hinged portions, and the lower or main section has centrally at its forward end a latch hook, there being at each side of the hook a level portion or seat on which the coupling link rests. The upper section of the coupling fits in an open recess



SMITH'S CAR COUPLING.

in the lower section, and has at its front end parallel depending flanges embracing the side walls of the drawhead portion of the lower section. In the bottom of the latch hook recess is a groove in which is a lifter bar whose ends are secured in the flanges of the upper section, the latter being held normally depressed by a plate spring, and the insertion of the link, as it passes over the coupling hook, lifts the upper section against the tension of the spring, which holds the inserted link in level position, with the lifter bar below its inner end. To release the link in uncoupling, a curved lever is pivoted in a longitudinal slot in the upper section, the toe of the lever having a bearing on the lower section, while its other end is connected by a chain with a transverse shaft on the end of the car. The shaft has a crank handle at the side of the car, and by moving the crank the upper section and the lifter bar are raised to release the link from engagement with the coupling hook. To hold the upper section and lifter bar in raised position, the transverse shaft is formed with a squared portion adapted to interlock with a square locking box, on pushing the shaft endwise, the link being then held in uncoupled adjustment for withdrawal. This improvement has been patented by John F. Smith, of Burbank, Ohio. It will be observed that, in cars equipped therewith, the coupling link may be easily placed to couple automatically with an approaching car, and that the trainmen do not have to go between the cars in uncoupling them.

A NEW RECORDING THERMOMETER FOR ATMOSPHERIC RANGES OF TEMPERATURE.

The novel and especially valuable feature of the recording thermometer herein described is that the recording portion may be located at a distance of twenty-five or thirty feet from the point at which the temperature is to be measured.

This makes it possible to obtain a continuous record of the outside temperature while the recorder is located at a convenient point within doors where it may be readily observed and its mechanism is not exposed to the detrimental influences of inclement weather. For cold storage plants where closed rooms are to be maintained at a constant temperature for the preservation of meats, fruits, and vegetables, an instrument of this kind is of great value, as the temperature may be observed without opening the doors.

The recording part (Fig. 1) is an application of one of Bristol's recording pressure gages. Fig. 3 shows an interior view of the recorder, which consists of a pen arm directly attached to the free end of a tube of flattened cross section bent into helical form.

The bulb portion (Fig. 2) is placed at the point where temperature is to be measured. It consists of a series of helical tubes constructed on the same principle as that in the recorder. The helical coils are suspended in a vertical position with their lower ends free, the upper ends opening into the capillary tube connecting them with the recorder.

The system of helical tubes forming the bulb portion, the pressure tube of the recorder and the capillary connecting tube are completely filled with alcohol under pressure and permanently sealed. As the temperature rises and falls where the bulb is located, there is a corresponding expansion or contraction of the alcohol which is communicated to the recorder and registered on a seven day chart graduated to read in degrees Fahrenheit.

Excessive pressures due to increased volume of the non-compressible liquid are provided against by the expansible form of the system of helical tubes of which the bulb is constructed. The total volume of the bulb portion is very large as compared with that in the pressure recorder, thus avoiding the necessity of compensating for ordinary changes of temperature in the room where the recorder is located. No correction is required for barometric changes, as only high ranges of pressure are employed.

This thermometer is being manufactured by the Bristol Company, of Waterbury, Conn. One of the instruments may be seen in operation recording the outside temperature at their New York branch office at 121 Liberty Street. The recorder is placed in the show window, where it may be observed from the sidewalk.

FORWARD'S MECHANISM FOR PROPELLING BOATS.

MECHANISM FOR PROPELLING SMALL BOATS.

A means of propelling small boats which enables the boatman to sit facing the bow, instead of looking rearward, as in rowing, is illustrated in the engraving, and has been patented by Walter Forward, of San Diego, Cal. The short propeller shaft in the rear of the boat has a wide pulley connected by two belts with three pulleys on a driving shaft, one of the belts being a crossed belt and the other a straight belt, and the center pulley being an idler. The driving shaft carries a fly wheel on the hub of which is a sprocket wheel, or a grooved wheel with pins in its groove, and an apertured belt engaging this wheel passes under a double pulley in the bottom of the boat, and forward, under the seat, around a similar wheel upon a shaft journaled in front of the boatman's seat. In front of the seat are parallel slideways, in each of which slides a block having a foot rest, and the blocks are each connected by a pitman with a crank on the driving wheel. By means of a belt shifter connected by a rod with a hand lever in convenient reach of the boatman, the belts connecting the drive shaft with the propeller shaft may be shifted so that the latter will be operated by either the straight or the crossed belt, to propel the boat forward or to back it, the driving shaft being continuously revolved in one direction by the alternate forward movement of the feet of the boatman pressing against the foot rests or pedals on the slide blocks. To facilitate adjusting the seat in the most convenient position forward or rearward, it is mounted on a racked or toothed support, the seat having a corresponding toothed portion for engage-

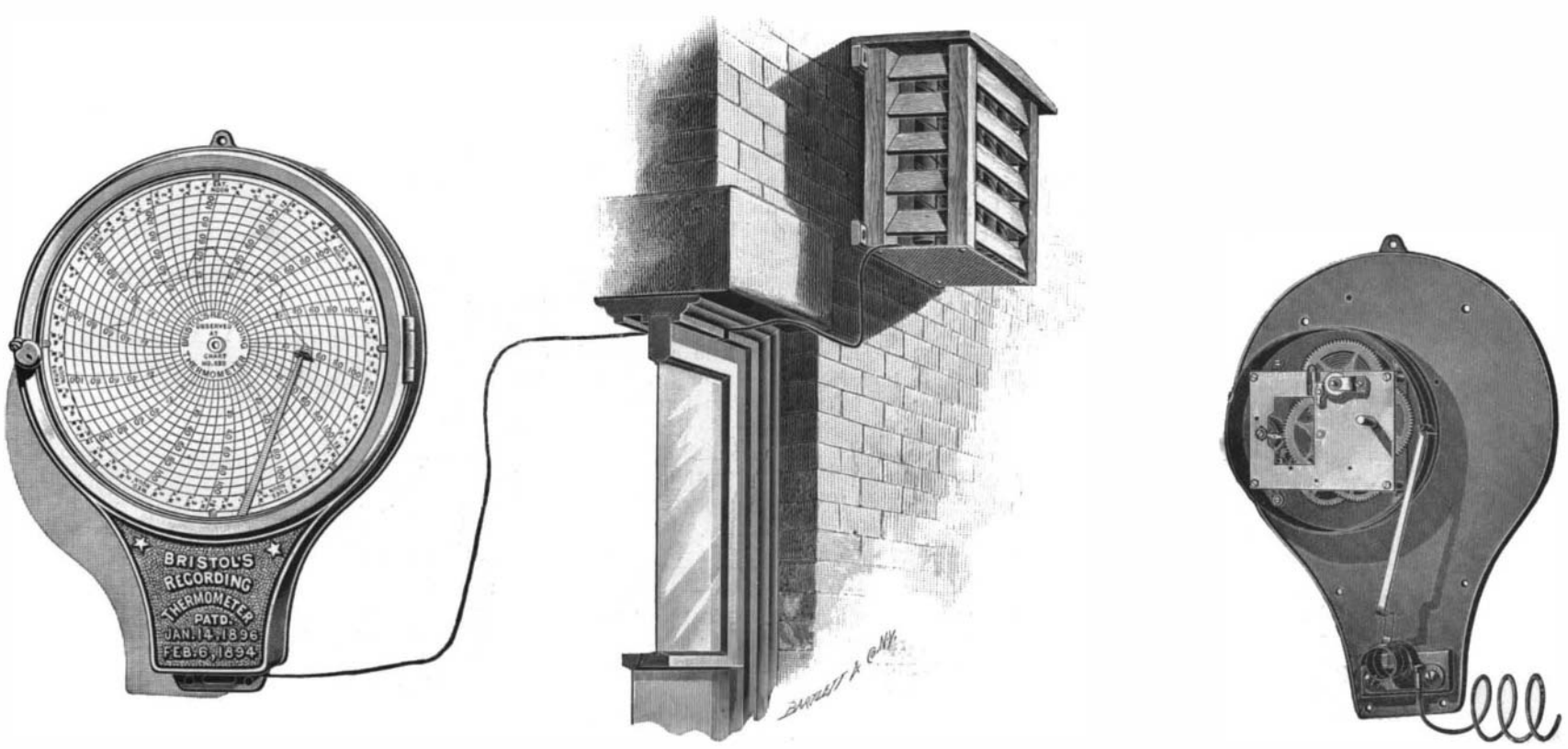


Fig. 1. Fig. 2. Fig. 3.

A THERMOMETER FOR MAKING AN INTERIOR RECORD OF THE OUTSIDE TEMPERATURE.

ment therewith. There are no ratchets or other mechanism to make a noise, and the boat is especially adapted for hunting purposes, enabling the boatman to quietly approach a desired point.

The Modified Milk Question.*

I have lately had opportunity for studying the remarkable work that has been done in Dresden in preparing a perfect substitute for breast milk.

The superiority of the Dresden modification rests mainly upon the recognition of an essential difference between casein and lactalbumen. Professor Lehmann's analyses of breast milk and cow's milk show that while cow's milk is more than twice as rich in casein, it is much poorer than human milk in lactalbumen, as may be seen in the following tables:

	Cow's milk.	Human milk.
Casein	3·0 per cent.	1·2 per cent.
Albumen	0·3 "	0·5 "
Fat	3·5 "	3·8 "
Sugar	4·5 "	6·0 "
Ash	0·7 "	0·2 "
Water	88·0 "	88·3 "
	100·0	100·0

If, therefore, cow's milk be diluted with water sufficiently to reduce the casein of the mixture to the amount found in human milk, the mixture will contain only one-third enough lactalbumen.

Furthermore, if the milk be sterilized, still further loss is occasioned, as the coagulated albumen is wasted in the scum and by clinging to the sides of the bottle.

We know the disadvantages of too much casein. We rightly dread the cheese curds in the dejections, for such undigested lumps not only show that the infant has not received the needed albuminous nourishment, but has had its intestine irritated by these foreign masses. But if we dilute the cow's milk sufficiently to avoid these cheese curds, we shall be starving the baby, unless we add some soluble albumen.

Three forms of soluble albumen are available: peptonized grain albumen, meat juice, and the white of egg. The last is undoubtedly the best, because of closest resemblance to lactalbumen and of easiest attainment.

THE DRESDEN METHOD.

To the white of one fresh egg slowly add 13 drachms (52 grammes) of milk sugar and vigorously stir, taking care not to beat air into the mixture, for egg foam will not mix well with water. To this paste slowly add a pint and a half of water, stirring constantly. This emulsion is then strained through fine linen into a pint of milk. Slight stirring or shaking completes the mixture.

The milk should be 9½ per cent richness in fat. The cheap lactometer gives a fairly accurate measurement. When the source of supply is not known to be unquestionable, it is probably better to sterilize the milk. The fresh egg partly compensates for the deadness of sterilized milk. Scurvy is becoming more prevalent in children fed wholly on sterilized milk. The milk sugar ought also to be sterilized in a seal jar if we wish the mixture to keep good for months. Vessels, strainers and cover cloths also sterilized.

It is a common mistake to add lime water or soda to modified cow's milk. Although to litmus cow's milk appears to be acid, it really is not so. The litmus test is deceptive in estimating the acidity or alkalinity of phosphate solutions. Lime water added to an infant's food overtaxes the stomach by wasting just so much gastric juice as is needed to offset the alkali. When the infant's digestion is weak, dilute hydrochloric acid added to the milk mixture is right in theory and of marvelous advantage in actual practice.

Again, as regards the custom of increasing the richness of the infant's food or of prescribing different qualities for different ages, it needs only to be said that it is as nonsensical as to prescribe increasingly richer beef and bread and potatoes for children as their years increase. A mother's breast milk increases in quantity as her baby's stomach grows larger, but there is certainly no such change in its quality as the intricate tables of our text books would lead us to believe.

How to Walk Upstairs.

Usually a person will tread on the ball of his foot in taking each step, springing himself up the next step. This is very tiresome and wearing on the muscles, says Public Opinion, as it throws the entire suspended weight of the body on the muscles of the legs and feet. You should, in walking or climbing stairs, seek for the most equal distribution of the body's weight possible. In walking upstairs your feet should be placed squarely down on the step, heel and all, and then the work should be performed slowly and deliberately. In this way there is no strain upon any particular muscle, but each one is doing its duty in a natural manner. The man who goes upstairs with a springing step you may be sure is no philosopher, or, at least, his reasoning has not been directed to that subject.

*By A. Worcester, A.M., M.D., Waltham, Mass., in Boston Med. and Surg. Journal.

Correspondence.

Roentgen Photography.

To the Editor of the SCIENTIFIC AMERICAN:

In repeating the experiments of Mr. Crumbie, described in the Electrical World, I obtained a negative with several images of each of the coins and keys used.

Feeling satisfied that the objects could not have moved while under the influence of the current, I exposed a plate to the action of several keys and coins, but without use of the induction coil or any exterior current whatever.

Now while I have seen numerous accounts of the results obtained by use of metallic objects inside the closed dry plate holder, with the aid of the electric current, I have failed to note any account of the same effect being obtained without the current, or a Crookes tube, or electric lamp, or something external.

Is it possible that the effect of metals on the dry plate has not been noted?

This effect, let it well be understood, is similar to the Roentgen effect, not a reduction under the metal, but the reverse, the reduction taking place around the objects, the film under the objects remaining unchanged and washing out in the hypo, giving the "shadows."

A coin and a piece of cardboard when placed together on the dry plate both gave shadows. Great care was taken to prevent access of light, and the plate and holder remained in the dark room during the whole experiment, thoroughly shielded from light.

If this matter has not been brought to the attention of the public, I would be glad if you will use the data I have sent you. F. W. TRAPHAGEN.

Montana College of Agriculture and Mechanic Arts, Bozeman, Mont., February 22, 1896.

[The images of the keys and coins in the photographs received from Prof. Traphagen are as clear and distinct as those in any of the radiographs we have published.—ED.]

The Recent Acetylene Explosion.

To the Editor of the SCIENTIFIC AMERICAN:

The recent explosion at a factory in Connecticut, in which it is said experiments were being made with acetylene, reminds me of an acetylene experiment which I once made unexpectedly. It was in 1880. I was cutting off a small piece from a ball of metallic potassium (under naphtha as usual), when a violent explosion followed. The thick glass bottle was blown to pieces and thirty of the pieces penetrated my hand, some going almost through it. The potassium was soft as usual, and there was only a gentle pressure of the knife. The knife was dry and there was no water in or near the bottle. If there was a flash accompanying the explosion, it could not have been very bright. The lecture room was instantly filled with a dense smoke, consisting in part of potassium oxide or hydrate, but mostly of dark fumes from the naphtha, which appeared to have been all vaporized or decomposed; at least it all disappeared from the place of explosion and there was no flame following. The explosion was very sharp and sudden, after the order of the fulminates, and shook a large building. That the explosion was confined to one of the potassium balls was proved by the fact that the other potassium balls that had been in the bottle were much flattened, but were still so far distinguishable they could be counted.

I immediately made inquiries from a number of chemists, but none of them had ever heard of an explosion of dry metallic potassium. At length Prof. Henry Carmichael, of Bowdoin College, Brunswick, Maine, informed me that he had heard of two similar explosions in Germany, and that German chemists had found that it was due to an acetylene compound formed while the potassium was in process of manufacture under hydrocarbons. In general, the chemists succeeded in freeing the potassium from this compound, but if they did not, it was liable to explode under a moderate pressure.

May not the recent explosion in Connecticut have been due to the same compound or a similar class of compounds?

Obviously if there are acetylene compounds that will fulminate by means of a jar or friction, or from any other cause, it is important to know under what conditions they are formed, in order that proper precautions may be taken. I therefore send you this for publication, in order to call attention to the subject and as a warning to those experimenting with acetylene. GEORGE H. STONE.

Colorado Springs, Col., February 15, 1896.

Spectrum of Mars.

To the Editor of the SCIENTIFIC AMERICAN:

There is a paragraph in a recent number of the SCIENTIFIC AMERICAN which refers to my observations of the spectrum of Mars, and concludes with the statement, "Now it turns out that M. Janssen has recently informed the French Academy of Sciences that he has determined the existence of water vapor in the planet Mars by means of the spectroscope."

I fear your note has been very misleading to many of your readers. M. Janssen's observations, to the results of which you refer, were made on Mount Etna in the year 1867, about twenty-nine years ago, and he communicated his results to the French Academy of Sciences in the year 1867, as follows: ". . . I believe I can announce to you the presence of aqueous vapor in the atmospheres of Mars and Saturn." (See Comptes Rendus for 1867, vol. lxiv, p. 1304)

Further, in my original paper on "The Spectrum of Mars," I called attention to M. Janssen's observations, quoting his results in full. I reviewed all the observations of Mars' spectrum, including M. Janssen's, in the Astrophysical Journal for June, 1895; and in that article I requested that we be given the details of his 1867 observations. In response, M. Janssen published some of the details of his 1867 observations in the Comptes Rendus for July 29, 1895, evidently the publication to which your note refers.

M. Janssen stated that his observations were made May 12 to 15, 1867. Perhaps we may say that at that time the diameter of Mars was less than 6 seconds of arc; that is, about one-fourth the diameter of the planet at a favorable opposition. We are not informed as to the apparatus which was carried up Mount Etna for making the observations, but the telescope was probably comparable with a 6-inch refractor. In brightness and width the spectrum would not be very unlike that of a bright star.

The question of Mars' atmosphere and its constituents has an intensely popular side and an intensely unpopular side. It happens that my observations led me to a middle ground conclusion; but since they did not prove the existence of an atmosphere and water on Mars, they are generally misunderstood to favor the absolute non-existence of those elements. Such, however, is not the case. So far as I know, every astronomer has always held that the planet has some atmosphere. The polar caps are satisfactory evidence on that point. My conclusion was that the Martian atmosphere is not sufficiently extensive to have been detected by the spectroscopic observations thus far made. It may be detected at some future time—I hope it will. If it is, I am confident that it will prove to be not more than one-fourth as extensive as our terrestrial atmosphere: that is, its density at the surface of the planet will not be more than about half the density of the atmosphere at the summit of the Himalaya Mountains. At least such is the conclusion which I drew from my observations when they were made.

At the opposition of Mars next winter I trust that valuable results will be obtained by a photographic study of the spectrum. It is quite possible that photographic methods will reveal traces of aqueous bands in the spectrum which visual observations could not detect. W. W. CAMPBELL.

Lick Observatory, Mount Hamilton, Cal.

Photographing Window Displays.

One of the greatest difficulties attached to photographing a window display is the reflection in the plate glass front of the buildings on the opposite side of the street and of the passing throng. Many trimmers will thank us for indicating a successful way in which their efforts may be taken by the camera without this annoying feature. If the artist will provide himself with a black curtain, mounted at each end on wooden poles, nothing more will be needed. It must be of sufficient size to screen the largest window, and a center aperture must be cut in order to insert the camera. This curtain, when held in place by assistants, will cut off the undesirable reflection and still admit light sufficient for all purposes from the top and sides. An additional advantage will be that the sensitized plate may be given as long an exposure as desired. When not in use the curtain can be rolled on the standards and thus be easily carried about from place to place.—Chicago Apparel Gazette.

Swiss Wood Preserving.

According to an English contemporary, a simple, effective and cheap way of preserving wood from decay is practiced in Switzerland in the preparation of posts for the telegraph service. A square tank, having a capacity of some 200 gallons, is supported at a height of 20 or 25 feet above the ground by means of a light skeleton tower built of wood. A pipe drops from the bottom of the tank to within 30 inches of the ground, where it is connected with a cluster of flexible branches, each ending with a cap having an orifice in the center. Each cap is clamped on to the larger end of a pole in such a manner that no liquid can escape from the pipe except by passing into the wood. The poles are arranged parallel with one another, sloping downward, and troughs run under both ends to catch drippings. When all is ready, a solution of copper sulphate, which has been prepared in the tank, is allowed to descend the pipe. The pressure produced by the fall is sufficient to drive the solution, gradually, of course, right through the poles from end to end. When the operation is ended and the posts dried, all the fiber of the wood is permeated with the preserving chemical.