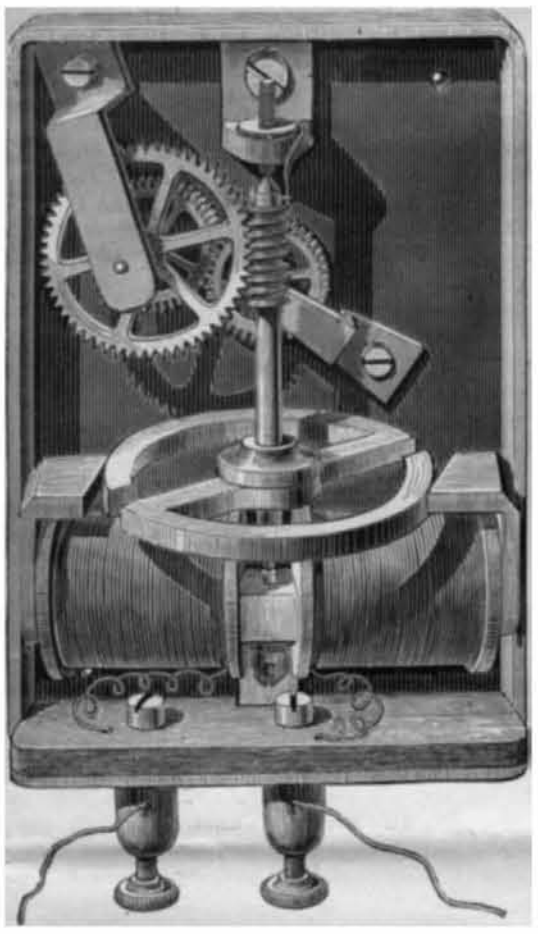
T. Walker, the present contractor. The accuracy with which the lines were taken and the engineering work carried through thus far is, of course, due to the engineering staff—Mr. Charles Richardson, assisted by Mr. A. W. Gooch and Mr. John J. Geach. The land portions of the work remain to be completed, and will, no doubt, occupy a considerable time. The tunnel will also have to be widened to a width of thirty feet, with a proportional height. The completion of the headings is, says the *Engineer*, a fact of great interest from an engineering and geological point of view, and gives every hope that the tunnel will now be completed by Mr. Walker, at a speed which will satisfy even the railway company.

ELECTRIC CLOCK-DIAL MECHANISM.

The construction of a perfect electric clock involves several difficult problems, and it is this which explains in part the existence of a large number of electric clocks varying in



ELECTRIC CLOCK-DIAL MECHANISM.

efficiency according to the attention paid to the fundamental principles which should control their construction.

Electricity actually plays three very distinct characters in the electrical clock, and the Paris Electrical Exposition presents numerous examples of this:

1. Electricity is made use of as a motive power, to swing a pendulum and replace the springs or weights of an ordinary clock.

2. Electricity is employed for transmission. A central clock sends an electric current every second, half minute, or minute, to one or more dials placed at a distance, which causes the hands to advance respectively a second, a half minute, or a minute.

3. Electricity is employed to regulate clocks and dials propelled by ordinary weights and springs, and adjusts the hands every hour, every six hours, or every twenty-four hours. It is this system of synchronism which has been adopted by the city of Paris for the public clocks.

We do not wish to discuss here the respective advantages of the two systems of distribution of time in a city by electric transmission or by electric adjustment effected at fixed intervals. The electric distribution of time has some special advantages which are not possessed by the system of electrical adjustment, and the disadvantages disappear in proportion as the apparatus is perfected and simplified. The pneumatic clock established in Paris two years ago has a transmitter operated by compressed air.

The engraving represents a simple electrical dial mechanism which exactly fulfills the requirements, working surely each minute under the action of the current sent by the central distributing clock.

All of the earlier forms of electrical dial apparatus are operated by an oscillating armature, moved by an electro-magnet and retracted by an antagonistic spring, or two electro-magnets acting upon a polarized armature. The movement of the armature is transmitted to the gearing by the levers and pawls, which must be very perfectly adjusted, as they cease to act if there is a little play, wear, or oxidation. In order to give a slight movement to the armature it is necessary to lengthen the lever immoderately.

All of these inconveniences are avoided in the very simple apparatus of M. Thomas, the mechanism of which is represented in the engraving. It is composed of a horizontal electro-magnet, the poles carrying two armatures, between which is placed a polarized armature in the form of an S, fixed upon a vertical axis. This axis carries an endless screw, which operates the minute hand and gearing. The transmitting clock sends into the electro-magnet alternate positive and negative currents at every half minute. The current sent is such that it develops in the poles of the electro-magnet alternate positive and negative polarity, so that the polarized S-shaped armature is first attracted and then repelled, causing a half revolution of the S-shaped armature for every electrical impulse. The current should continue from two to three seconds, in order that the polarized armature may be maintained in position. The endless screw carries along the gearing and causes the hands to advance each time.

In consequence of its inertia the polarized S shaped armature tends to pass beyond its half revolution, and the speed acquired toward the end of the half revolution is checked by means of a spring against which a pin carried by the vertical spindle strikes at each half revolution.

This simple and ingenious apparatus requires no regulation. The rotation will be produced, whatever may be the distance from the extremities of the polarized armature to the electro magnet, and this distance may vary from one to two millimeters.

The power of the apparatus is determined by the dimensions of the S shaped polarized armature of the electro-magnet, and by the size and length of the wire which surrounds them.

By using a high tension current of electricity a large number of these electrical dial movements may be placed upon the same circuit and made to operate dials of two meters in diameter.

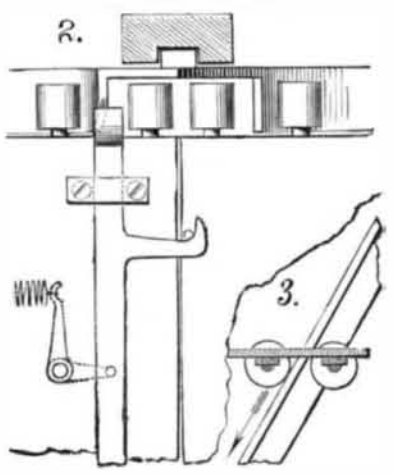
At the Exposition of Brussels, in 1880, where the electric dial mechanism of M. Thomas was in operation for the first time, he had in the same circuit a large dial of 1·80 meters in diameter and eighteen other smaller dials of 0·50 meter and 0·40 meter. They worked perfectly, excepting the five or six interruptions proceeding from the stopping of the transmitting clock caused by the moving of the platform on which the clock was placed.—*La Nature.*

Fire Risks and Tall Buildings.

We have frequently called attention to the fact that modern architecture was the greatest peril with which our large cities is threatened. During the present year, thousands of new buildings are being erected in this city, and of these a large number are tall buildings, seven, eight, and nine stories high, insecurely built from the foundation to the mansard roof, having granite foundations to support cast iron columns, which in turn support iron girders, upon which the floors are laid. Such a building is dangerous for a fireman to enter when a fire is raging within, as the granite foundation is liable to melt away under intense heat, and the iron columns and girders to twist and break, precipitating the floors above, with all their contents, into the basement. Put on top of such a building a mansard roof made of pine, and introduce an elevator shaft to carry the flames almost instantly from one floor to another, and you have a modern death trap that could scarcely be improved upon as a fire hazard, threatening the surrounding buildings and the lives of whoever may venture near it. In the lower part of the city there is one building whose roof is 185 feet above the sidewalk—away out of the city limits—and near by are many others nearly as tall. A fire in that roof would be wholly inaccessible to the firemen, while a high wind would scatter the blazing brands upon the roofs of lower buildings for many blocks.—*Fireman's Journal.*

IMPROVED HATCHWAY DOORS.

The accidents and dangers chargeable to open hatchways are too familiar to our readers to need recital, and it must be acknowledged that the various trap doors, gates, and other appliances in common use for rendering hatchways safe, are deficient in one way or another



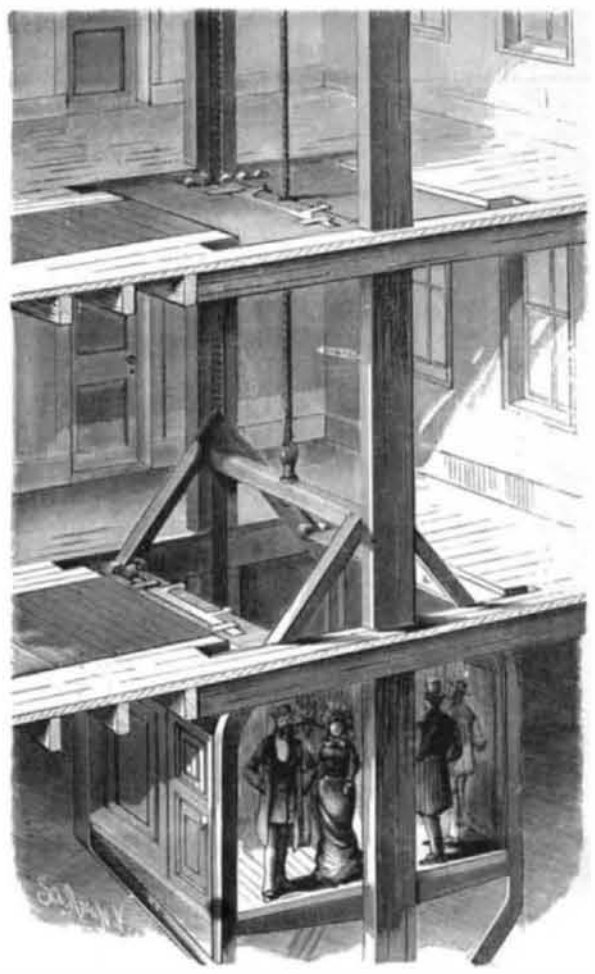
CHAMBERS' AUTOMATIC HATCHWAY DOOR.

Section showing angle irons, rollers, and fastener.

Our engravings represent improved automatic hatchway doors, which are opened and closed by the elevator car as it passes through the floor on which the doors are placed.

The doors are made of heavy boiler iron or of wood, and are placed either under or on the floor, or under the ceiling, as choice or convenience may require, and are so constructed as to easily move or slide horizontally upon rollers or tram-rails. Their operation is positive and automatic. The apparatus is simple, and can readily be applied to any platform elevator already in use. It consists in the attachment of angular irons about the cab or platform so as to form cam braces above and below it, as is indicated in the engraving; and as the platform passes up and down these angular irons run between two wheels or rollers attached to the doors, causing the doors to open as the platform approaches them and close as the platform passes through, making a complete covering for the hatchway—preventing any one from falling through—cutting off draught in case of fire, and when opening conveying safely off any one who may inadvertently stand in the way. Open hatchways become flues, conveying fire and smoke from floor to floor, with uncontrollable rapidity. The improvement shown in the engraving will confine to the floor where the fire originated.

In storerooms requiring heating these doors are found very efficient in preventing the escape of heat from one floor to another. The improvement also prevents the floods of dust and dirt which are constantly pouring through open hatchways.



CHAMBERS' AUTOMATIC HATCHWAY DOOR.

For further information address the Chambers Elevator Company, 145 Central avenue, Cincinnati, Ohio.

Electrical Measures.

At the late Electrical Congress in Paris a committee on electrical units made the following recommendations, which were unanimously adopted: 1. The fundamental units be the centimeter, gramme, and second (C., G., S.). 2. The practical units, ohm and volt, to retain their present definitions. 3. The unit of resistance, or ohm, to be represented by a column of mercury of a square millimeter section at the temperature zero Centigrade. 4. An international commission, to be charged with the duty of determining by new experiments, for practical purposes, the length of the column of mercury, of a square millimeter section at zero Centigrade, which represents the value of the ohm. 5. The name ampère to be given to the current produced by a volt in an ohm. 6. The name coulomb to be the name given to the quantity of electricity defined by the condition that an ampère gives one coulomb per second. 7. The name farad to be given to the capacity defined by the condition that a coulomb in a farad gives a volt. Until something better is discovered than the English candle, the French *Carcel bec,* and the German standard for the measurement of the electric light, preference will be given to the Carcel lamp.

A Can Soldering Machine.

Mr. Henry R. Robbins, of Baltimore, Md., has patented an improved machine for soldering the heads of tin cans to the bodies thereof. In this machine the cylindrical body of the can, having its heads applied, is held in horizontal position, and rotated by vertically moving supports and rotary holders or clamps, while the molten solder is discharged upon the joints of the can heads from an upper receptacle by hollow pistons or chargers which are controlled by the operator. A liquid flux is automatically supplied to the joint and soldering irons brought in contact with the can by the same motion which brings the latter up against the discharge tubes of the molten solder receptacle containing the chargers. A single rotation of the can holders will suffice to secure a firm soldering of the heads to the body of the can, which may then be removed by sliding one of the rotary can holders away from its end of the can. The machine is very ingenious and complete in all its details.