the automatic transmitter of the indications of the letter of the alarm and of the name by which it is recognized. This transmitter, which is not very complicated, comprises, in the first place, a cam wheel carrying three times upon its circumference, in Morse characters, the indicating letter, and secondly, a motive weight whose card is wound around the axis of the wheel, and causes it to make an entire revolution when the door opens. The play of a lever is controlled by the cams. At rest this lever communicates with the ground through a movable arm and a special spring. Every passage of a cam lifts a tappet and brings the lever in contact with a special screw for a greater or less length of time, according as it is a question of a dot or a dash. The circuit is completed by the earth, and a Morse receiver located at the engine house inscribes a dot or a dash, and finally the letter (or rather the letter three times) characteristic of the alarm.

At the engine house, at the moment at which the first emission of the current occurs, as a consequence of the opening of the door of the box, a bell is heard to ring to call the foreman. At the same time, through an original mechanism that we cannot describe, the Morse receiver is freed automatically, and inscribes the indicative of the calling alarm. After the triple inscription of the letter A (– —), if it is a question of the apparatus of Chateau-des-Rentiers Street, the fireman unhooks his telephone. and this movement interrupts the bell of the alarm. The person who is calling knows then that he can signal the fire in the telephone. At this moment a pin fixed upon the cam wheel has lifted the movable arm, made it tilt, and put the telephone in circuit. The fireman inscribes the indications given, and when they are very clear he depresses a speciallever, introduces the current of the battery upon the line, and, thanks to an interrupter, the telephone of the alarm renders a sound announcing to the person interested that the firemen are apprised (Fig. 3).

All the maneuvers are, therefore, very simple. But the Digeon apparatus has other advantages. It permits notably of keeping the men who have started for the fire in communication with the house, in order to ask for re-enforcement, for example. In fact, every alarm is provided at the side with a door that is opened with a special key and exposes a jaw into which are introduced the wires of a movable telephone and a Morse key to effect calls. We must not omit to mention particularly the movable telephone that is employed in this case. It is due to Commandant Krebs, like the one that is arranged in the alarm. It is a question in both cases of a remarkable magnetic transmitter. The vibrating plate is 98 millimeters in diameter in the stationary apparatus and 77 in the movable. For the latter, it is coupled with the Ader receiver mounted through a slide upon the junction rod.

Let us say further that Mr. Digeon has devised a low priced alarm designed for private houses. It is of wood, is fixed against a wall and is wound up through the opening of the door. Besides, the telephone is accompanied with two receivers that permit of communicating with the engine house. These apparatus can be connected gratuitously with the municipal system.

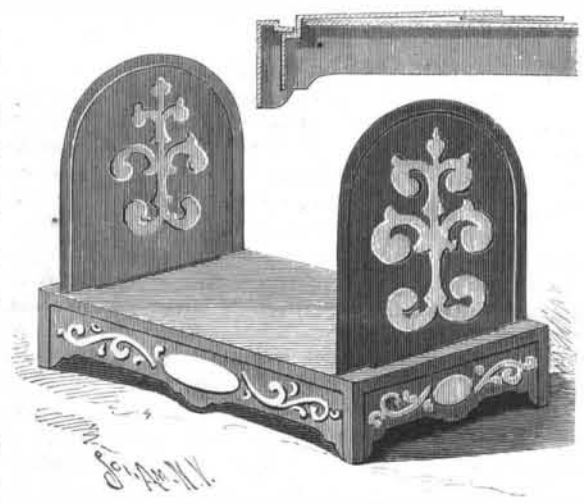
It is opportune at the moment in which Paris is thus improving its fire service, to remark that Brussels, our closeby neighbor, possesses a very remarkable installation of electric alarms. Forty bureaux of communal administration are subscribers to the telephone system. There are fifty automatic electric fire alarms connected with twelve receiving stations. Twenty-one telegraphic stations connect the police offices and stations with the central office, and at the latter there end eighteen telegraph lines coming from the police stations of the seven faubourgs. It is necessary to add to this thirty-seven microphone and eighteen telephone stations putting the services of the external administration in communication with the City Hall. It will be understood that these are so many stations capable of serving to send out alarms of fire.—*La Nature.*

Determining the Densities of Gases.

A recent number of *Nature* contained the following notice of a convenient modification of the hydrometer method of determining the densities of gases, devised by M. Meslans, whose apparatus is described and illustrated in the *Comptes Rendus*. It consists of two hollow spheres hung to the arms of a balance. Each sphere, which is made of glass, aluminum, or gilt copper, hangs in a separate compartment, the suspending thread being introduced through a hole in the lid. The compartments are inclosed in a box, and surrounded by water in order to keep them at equal temperatures. They are at first filled with air to determine the position of equilibrium. The gas of which the density is to be determined is then introduced through a long tube immersed in the water, and enters one of the compartments, having previously been dried. It is passed through in a slow and continuous stream; and if its density differs from that of air, the equilibrium of the balance is disturbed. The weight necessary to re-establish equilibrium is noted, and the density calculated according to a simple formula. Thus the density of a particular gas is found by a single weighing; and by keeping the current continuous, variation in its density is easily observed. A fairly high accuracy is attainable, depending upon the sensitiveness of the balance and upon the perfection of gauge of the spheres. One important application of the apparatus is that for determining the density and composition of the products of combustion in furnaces. The scale of the balance is graduated so as to show at a glance the percentage of carbonic acid, and hence the degree of efficiency of the furnace in question. This percentage, which is about 21 theoretically, never exceeds 18 in practice, except in gas generators. In a great number of works it varies between 6 and 8. The apparatus is being applied to the study of the various methods of heating. Another application is that by which the presence and percentage of marsh gas is indicated. With spheres of 1 liter capacity and a balance sensitive down to 0·5 milligramme, it was found possible to detect 0·1 per cent of methane in the air of a mine.

A METALLIC BOOKCASE.

The illustration shows a simple form of bookcase or stand adapted to rest upon a bureau, desk or table, and contain a set of works or books of reference in frequent use, the number of volumes being regulated by the length of the stand. The improvement has been patented by Dr. James Stimson, of Watsonville, Cal. In its simplest form the base may be formed of a single piece of metal and struck up with a die, a single piece of metal also forming each of the end pieces. Near each end of the base is a transverse slot, along the outer edge of which the metal is sunk or depressed to form a step or recess, as shown in the small view. The clamping arms forming the end pieces are essentially L-shaped, but with a stepped angular portion connecting the horizontal and vertical portions, the arms



STIMSON'S BOOKCASE.

when not in use folding down upon the base and upon each other, enabling the stand to be compactly folded and stored away. In use, the upper members of the arms are brought to a vertical position, as shown in the large view, the inner members then engaging the under face of the base.

Fire-Resisting Glass.

An interesting test of fire-resisting materials and construction was recently carried out in Berlin, under the auspices of the fire brigade and the insurance companies of the city. The idea of the tests was mooted as far back as 1889; but there was considerable difficulty in arranging for a series of "fires," which were intended to be as "natural" as possible, and yet should not be dangerous. Finally, the municipality gave the experimenters the use of an old warehouse for their purpose; and this building, having been fitted up to represent various types of fire-resisting structures, was duly set on fire. Care was taken to subject the exhibits to the temperatures, irregularities of heating, sudden shocks by falling weights or jets of water, etc., which generally occur at conflagrations; and it was found possible to take fairly exact observations. Among the most satisfactory results obtained were with the fire-resisting glass made by Messrs. Siemens, of Dresden. The assessors declare it to be most suitable for any skylight or window necessary in a division between separate risks, as it will resist a temperature of 1,300° C. for half an hour and more; bearing all manner of shocks and strains without suffering appreciable damage. Care is required in fixing this glass, however, as the iron frames generally used for the purpose buckle under heat, and show, between the glass and iron, openings through which flame can pass. Some of the so-called fireproof floors made of iron girders and concrete came to speedy grief in these tests; while iron and brick floors stood very well, as did the "Monier" construction (as to which reference has been already made in the *Journal*). As regards fire-proof doors, nothing stood better than double oak covered with thin sheet iron, between which and the wood there should be a layer of asbestos cloth. Seeing how many warehouse fires are propagated through windows, the assessors attach great importance to their demonstration of the capability of Siemens glass for withstanding flame.

No Oxygen in the Sun.

At the recent annual meeting of the five academies in Paris, M. Janssen read a paper on his observations at Mont Blanc Observatory on September 14 and 15, as to the absence of oxygen in the solar atmosphere. This discovery, he said, revealed a fresh harmony in the constitution of the universe.

"We already knew the chief features of the constitution of the sun and the admirable conditions realized for insuring both the abundance and the durability of the radiation diffused by it over the planets surrounding it. We knew that this incandescent surface of such a slight thickness which surrounds the sun and in which resides this virtue of radiation renews itself by reserves of heat drawn by it from the central mass. We also knew that this radiating surface is protected from contact with the icy celestial space by several gaseous envelopes. Among these envelopes or atmospheres the uppermost and doubtless most effective as to protection is the so-called corona, which in total eclipses produces the splendid phenomenon of the 'glories' and of the crown. This atmosphere is mainly composed of hydrogen, the lightest and most transparent of known gases. The chief function of radiation, the very purpose of the central orb, is thus insured by this transparent and protecting atmosphere. But we now see that by a not less admirable arrangement the body which might some day jeopardize this function has been carefully excluded. Thus science as it advances constantly reveals to us new laws and harmonies in the constitution of the universe."

Prizes for Electrical Inventors.

It can hardly be doubted, says the *Electrical Review*, that there will be a good number of American competitors for some of the following named prizes which are offered by the French Society. A prize of $2,280 will be made in 1898 for the discovery that is most useful to French industry. A prize of the same amount is given every three years by the society (the next award will be made in 1895) to the person making the most useful industrial discovery. The Henry Giffard prize of $1,140 is awarded every six years (the next award will be in 1896) for services of signal value to French industry. The Metzen's prize of $95 is awarded every three years (the next award will be in 1896) to the discoverer of a valuable chemical or physical application in electricity, ballistics or hygiene. The special prizes for 1894 are: $380 for a motor whose weight is not less than 50 kilogrammes per horse power; a prize of $570 for an apparatus that shall decrease materially the smoke of furnaces, especially those under boilers; a prize of $190 for a heavy oil engine; a prize of $570 for a steam engine consuming at the maximum speed, under average load, seven kilogrammes of steam per horse power per hour; a prize of $570 for the discovery of a substance that can be substituted completely for gutta-percha in at least one of its applications, or for work that will continue to develop the production or improve the cultivation of the gum. The following prizes are to be awarded in 1895: A prize of $380 for a small motor designed for use in a shop located in a house; a prize of $380 for the preparation industrially of ozone and means for its application; a prize of $380 for an apparatus or a process which shall make it possible to measure or determine the insulation of the different parts of an electric installation while the current is on; a prize of $570 for investigations which shall contribute to the discovery and application of the best means in domestic and general product for the purification of drinking water. Competitors must submit their proofs by the 31st of the December preceding the year on which the prize will be awarded.

Hydrogen.

An interesting example of the capacity of some of the oldest and most hackneyed chemical reactions for improvement is supplied by a communication of Mr. John Ball, of the Royal College of Science, South Kensington, to the *Chemical News*, upon the preparation of hydrogen by the ordinary zinc and acid laboratory apparatus. Mr. Ball states that he has recently observed that, by the addition of a few drops of a solution of nitrate of cobalt to the acid and zinc, the rate of evolution of hydrogen is enormously accelerated, especially at the beginning of the reaction. The effect is the same with either hydrochloric or sulphuric acid; and a couple of drops of solution of nitrate of cobalt will suffice for a large quantity of acid. The action does not seem to have been noticed before; and it should be useful in the rapid preparation of hydrogen in the laboratory. Most, if not all, of the cobalt salt is quite unaltered. There appears to be a very thin film of cobalt deposited on the zinc, which probably acts with the zinc as a voltaic couple; but the amount of cobalt deposited appears to be too small to weigh. There is no particular virtue in the cobalt in this regard; a solution of a nickel salt exerts a similar action.