The Municipal Fire Telegraph.

[Concluded from page 219.]

The signal stations of Boston consist of cast-iron boxes of great strength fastened to the outside of buildings and connecting with the wires above by means of insulated conductors, enclosed in an iron gas pipe. Each of these boxes contains a signal key for police communication, and also for some uses of the Fire Department—an electro-magnet included in the circuit, and having an armature carrying a hammer, which raps against the side of the box, as a means of return communication by sound from the central station,—a discharger of atmospheric electricity, which has already been mentioned, and a signal crank, by which the existence and location of a fire is made known to the centre. The signal crank carries a circuit wheel, either on its axis, or at a slower rate by means of gearing, which wheel has the proper number of teeth or cams on its periphery to lift a spring and break the circuit in such a manner as to signalize the number of the Fire District, and also the number of the station, to the centre, at each revolution. The number of the Fire District is given in dots, that of the number of the station by a combination always of dots and lines. Thus the record produced at the central station, by each rotation of the crank in the box, marked District No. 3, Station No. 4, might be as follows: . . . .—.

The name of the person keeping the key of each signal box is marked upon the door. In case of fire the box is opened, and the crank turned half a dozen or a dozen times. The locality of the signal boxes is carefully chosen, usually opposite to a gas lamp. The central station in Boston is the City Building, from a bracket on the roof of which the wires radiate in all directions. Here the receiving instruments connected with the signal circuits, the transmitting instruments, connected with the alarm bell circuits, the testing instruments, and the batteries for the whole system, are placed. An operator or watchman, the only one required for controlling the whole system, is also stationed here.

The instruments receiving the communications, either of Fire or Police, from the signal boxes, consist, first, of three receiving magnets mounted on the same stand and connected, one with each of the three signal circuits; and, second, of a triple office alarm or call and a Morse register, with three electro-magnets, levers, and pen points, marking side by side on the same strip of paper, which alarm and register are operated by the receiving magnets and a local circuit. The office alarm consists of three powerful electro-magnets, each striking a blow by means of a hammer connected with the armature on a bell of a tone different from the others. A separate alarm and record is thus obtained for each signal circuit.

The signal of a fire having thus been received at the central station, the operator turns at once to the transmitting apparatus connected with the alarm bells, which consists of the district key-board. This instrument, in its simple form, is a circuit cylinder, carried by clock-work, with keys marked with the district numbers, which bear upon the cylinder when depressed, and complete the circuit at intervals, so as to produce the district signal on the bells with proper pauses, so long as the key is held down. The district key-board may also be constructed in a way similar to the striking motion of a common clock so as to complete the circuit the requisite number of times when the key of each district is depressed by the action of a gathering pallet. This gives less numerous surfaces of electrical contact, and is therefore preferable, and has been adapted to the system at Boston by Mr. Farmer. It has seven keys for the fire districts, one key for continued blows at two seconds interval, or fast ringing at the commencement of an alarm, and one key which gives the signal *one, one-two* for "all out," which is always to be struck upon the bells, when a fire is extinguished, to allow the engines which have not reached the fire to return home. There are also two spare keys not yet appropriated.

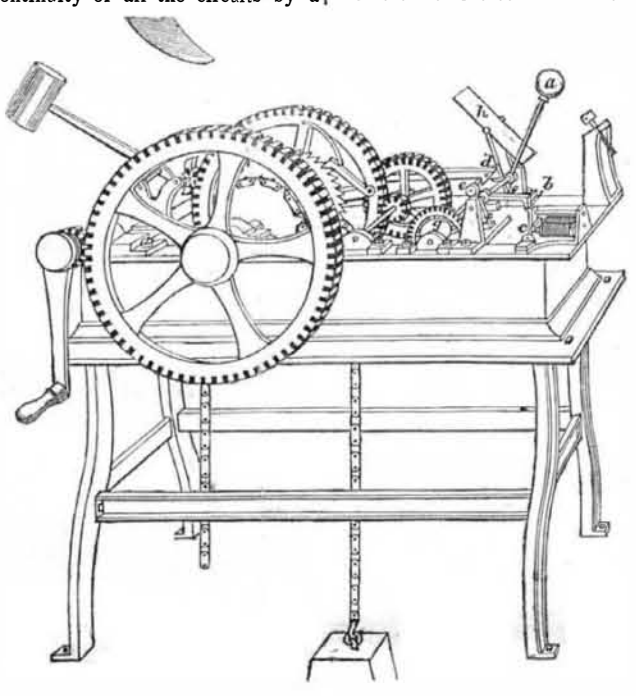
For the sake of economy in battery power, the current is thrown on to the three alarm circuits, separately, but in rapid succession by the arrangement of the key-board. The effect of this upon the synchronism of the bells is inappreciable, when compared with the effect of distance upon the sound of different bells.

An alarm bell register is connected with the district key-board, having a dial for each alarm circuit. This is so constructed, by means of an electro magnet armature and ratchets that a hand on each dial is carried forward one-thousandth of a revolution each time that the battery current is sent out to the alarm bells. It is consequently known in the office how far the various striking machines have run down, and if it is necessary to wind them in anticipation of their usual weekly time.

The testing apparatus consists either of a common clock or an electro-magnetic clock, so arranged as to send the current of a testing battery over all the circuits, once an hour, or more frequently. Each circuit communicates with an electro-magnet having an armature carrying a hammer, and striking a bell when the circuit is completed. At the City Building, in Boston, an electro-magnetic clock thus tests the continuity of all the circuits by a chime of six bells of different note, at the regular striking time of the clock. The battery employed is purposely so feeble that it will not set off the striking machines in the alarm belfries.

The keys upon which the clock operates as above, are attached to a single board, and are also finger keys, by which the circuits may be tested at any intermediate time. The three testing keys of the signal circuits have also the important function of police communication. By means of these communication can be held backwards and forwards between the central station and the 40 signal boxes. The signal battery connected with the closed signal circuits, at the central station, is about twelve Grove cups. The battery connected with the alarm circuits, and sufficing to liberate the hammers of all the bells, is about 35 Grove cups, though a smaller number may easily be used. This battery, in the south circuit of three and a half miles, liberates nine bell hammers at the same instant.

There are nineteen alarm bells included in



the three alarm circuits, which are called into action at will by means of the electric current. In the belfry of each of these is a powerful striking machine which will now be described. This resembles the striking movement of clocks, made, however, to strike only one blow, and having, as its chief peculiarity, the very beautiful secondary electro-magnetic apparatus for the liberation of the detent, contrived in 1848, by Mr. M. G. Farmer, and for which, or its equivalent, in a weight or spring, he has applied for a patent in its application to machinery. The figure represents the precise form of instrument as well constructed by Howard & Davis for the city of Boston.—For striking the large church bells they are at present carried by weights of about twelve hundred pounds, and raise a hammer of 45 lbs. on a handle four or five feet long. The hammers strike through an arc of from two to three feet, with a force equivalent to 800 lbs. falling one inch.

The frame is a most substantial casting. The electro-magnet will readily be recognized, with its armature attached to an upright lever at *c*. The legs of the electro-magnet consist of half-inch soft iron, surrounded with coils of insulated copper wire No. 23, which are three inches long and two inches in diameter. *a* is a falling arm, weighted at the top, which is supported in an upright position by a horizontal lever, resting on the top of the armature lever at *b*. When the armature is attracted to the magnet, the weighted arm, *a*, falls over until stopped by the adjustable rest in front of it. In falling, a little lever, seen attached to the same axis, raises the latch-shaped detent, *d*, by means of the pin connected with it. The arm carrying the pin, *e*, attached to the same axis with the cam, *g*, and connected with the train of wheels of the striking machinery, is thus liberated, and commences to revolve on its axis. In so doing the cam, *g*, swings forward the bar, *f*, attached to the axis of the falling arm, *a*, which is thus raised to its original position; the horizontal lever catches again at *b* if the armature has been released, the detent, *d*, falls, and the pin, *e*, is arrested at the end of one revolution. This occupies two seconds, and in the meantime the weight of perhaps 2000 lbs. has fallen an inch, and a single blow has been struck by the hammer. If the armature were not released from the attraction of the electro-magnet, the horizontal lever would not catch at *b*, and the machine would continue to strike, until the circuit, influencing the electro-magnet, was interrupted. This indefinite and undesirable mode of striking would be produced by holding down the alarm key at the central office. To obtain single blows, for the purpose of definite alarm, the circuit must be completed momentarily at suitable intervals, which is best effected by means of the district key-board. The fly-wheel of the clock-work is shown at *h*. The hammer represented in the figure is usually placed in a belfry above, connected with the hammer lever by a wire.

As part of the bells in the Boston system are also rung for other purposes, an automatic shut-off or switch is connected with the bell-frames, so that the battery current is diverted from the coils of the striking machine when the bell is in motion, and strikes a little electro-magnetic call to inform the sexton that there is an alarm of fire, to which he should give precedence, by ceasing to ring.

An apparatus has been described by Messrs. Channing and Farmer for furnishing a constant supply of condensed air by means of the water under pressure in the pipes in cities, which may be applied either to carry a bell hammer, by means of an air engine, or, still better, to operate an air whistle, by means of the telegraphic circuit. The water metre of Huse, or other water engines may also be used to lift the bell hammers. The advantage of such an application is the constancy of the power without the necessity of winding up and consequent limit of force and number of blows.

The experiments recently made in Boston show that the signals are instantly received at the central station from the most distant signal boxes, and that a reply is at once given on the bells with precision and certainty. The striking machinery is not yet adjusted so as to develope the whole amount of sound which can be obtained from the largest bells. As alarms are given by tolling hammers in New York and other cities, no difficulty will be found in bringing out any required amount of sound, in accordance with simple mechanical laws. The telegraphic and electro-motive part of the system, which is the novel part, is perfect and unerring in its action. It is worthy of notice that the circuits in Boston have not been interrupted by any casualty during this winter of unprecedented severity, since they were first completed in December.

To show the operation of the system, let us now trace the alarm of fire which, in describing the signal box, we supposed proceeded from district No. 3, station 4. The operator at the central station on receiving the signal immediately passes over to the district key-board and holds down the key for fast ringing. All the nineteen bells immediately begin to strike two-second blows. After a minute or two the operator raises his finger, and then depresses the key marked 3. The bells now strike the district signal of three blows at intervals of two seconds and them pause six or eight seconds and repeat, as long as the key is held down. Very soon a hurried signal is received over one of the signal circuits. This comes from the random rapping of an engineer on the key in one of the signal boxes, and is understood by the operator as an inquiry for the number of the station from which the alarm proceeded. This the operator immediately communicates by counting four raps by means of his testing key, on the electro-magnet in the signal box from which the inquiry came. The engineer now knows the locality of the fire within fifty rods, and heads the engines directly to the spot.

Meanwhile the fire is perhaps easily extinguished. The engineer in command sends to the nearest signal box, and taps *one, one-two—one, one-two*, on the key. The operator at the centre receives the communication, and forthwith depresses the corresponding key of the key-board. The nineteen bells at once strike the signal a few times, and the engines in all parts of the city turn back.

By a multiplication of signal stations, and a suitable provision of bells, the Telegraph Alarm system becomes instantaneous, universal, and definite in its operation. The experienced gained in the construction in Boston, will make the application in other cities and towns comparatively easy. In cities like New York, where there are a few large alarm bells, the telegraphic machinery can be applied with great advantage, so as to strike a blow of any required force, and to bring the bells into operation separately or together, so as to limit or extend the alarm. Only one person is required at the centre to wield the whole of such a system, which provides also for a vital organization of the Police body throughout the whole Municipality.

The expense of the system, completed, in Boston, may be estimated at $15,000. For small towns a similar organization might be effected for $1500 or $2000, and for the largest city, as New York, the work might be constructed in the most perfect and elaborate manner, bringing every building, as in Boston, within fifty rods of a signal box, for about $50,000.

The government of the city of Boston deserve credit for the liberally with which they have thus brought a new application of science to the test of construction. Great credit is also due to Mr. Farmer, the superintendent of construction, in addition to his original contributions, for the practical direction by which the parts of so extensive a system have been brought into harmonious action.

Disease by Bank Notes.

The Cincinnati Enquirer, in noticing the statement of Dr. Buckler, of Baltimore, that small-pox is often communicated by means of bank notes, says:—

"The teller of one of the banks of Columbus, an estimable young man, contracted the disease by handling a batch of bills which had been transmitted from this city, where the small-pox was then quite prevalent and in malignant form. The young man died—and by such a seemingly harmless communication, was that loathsome pestilence the cause of a family losing their main stay in life."