City Document.—No. 20.

CITY OF BOSTON.

COMMUNICATION FROM DR. WM. F. CHANNING

RESPECTING A

SYSTEM OF FIRE ALARMS.

In Board of Mayor and Aldermen, March 24, 1851.

Read and referred to the Joint Standing Committee on Public Buildings, with authority to report in print.

Sent down for concurrence.

JOHN P. BIGELOW, *Mayor.*

In Common Council, March 27, 1851.

Concurred.

FRANCIS BRINLEY, *President.*

BOSTON, MARCH 24, 1851.

TO HENRY B. ROGERS, ESQ.

DEAR SIR,—

With this note I beg leave to place in your hands a communication to the City Goverment on the subject of Fire Alarms.

A general view of the system proposed may be found in the memorial occupying the first four pages, and in the "Example of operation" in the papers annexed.

I have examined two experimental instruments for striking alarm bells by means of electro-magnetism, which were constructed for the City, as I am informed, in 1848, and to which I refer in my communication. These instruments need some repair, but may then be used to exhibit to the City Government the principle of the application proposed, in a very satisfactory manner, —as follows. Let one of these instruments be connected with the bell on the roof of the Court House, and the other placed in the belfry of the Stone Chapel, with the slight associate apparatus which is necessary, and with wires, connecting the buildings with each other and the City Hall. A small battery of a few tumblers and an alarm key may be placed in the room of the Mayor and Aldermen, and connected with the circuit. On depressing the alarm key, both bells would be struck simultaneously, and, as they are so near, the effect could be readily observed.

Should my communication be printed, I shall be

glad to have it submitted, for an opinion, to scientific and practical men, who have the public confidence, and who have made electro-magnetism and the electric telegraph subjects of special attention.

Should the Committee to whom it may be referred, wish any explanation, or desire any experiments, in my power to make, I will appear before them and give freely my time and any information which I may possess.

Respectfully yours,

WM. F. CHANNING.

To the Mayor and Aldermen of the City of Boston.

The undersigned, a citizen of Boston, respectfully asks the attention of the City Government to a plan for the definite, instantaneous and universal communication of Alarms of Fire, which plan has already been presented, in its general principles, to the public, and which was the subject of a recommendation to the City Government, in the annual address of Hon. Josiah Quincy, jr., in 1848.

This plan is the Application of the Electric Telegraph to signalizing Alarms of Fire.

The conditions of a perfect system of this kind are,—first, the instantaneous communication of the intelligence of a fire,—second, the means of striking a definite alarm, simultaneously on all the alarm bells in the City,—third, security against interruption of such means of communication and alarm,—fourth, security against false alarms, and entire control of the agencies employed, by the officers of the fire or police departments.

In presenting such a plan to the City Government, with a map and description of the apparatus required, and with estimates of the cost of all parts of the same, furnished by men of skill and experience in their respective departments, the undersigned is influenced chiefly by the belief that the applications of the electric telegraph belong to civilization, and that such a system of communication as the one proposed,—which can be applied also to many purposes of police and internal arrangement,—is essential to the efficient and living or-

ganization of a large community. The undersigned has no personal interest beyond that of any other citizen, in the adoption of the plan proposed. His connection with it arises from the fact that he was the first, as he believes, to propose publicly this application of the Electric Telegraph, which was described by him in detail in the Boston Daily Advertiser of June 3, 1845, and which he has also, on other occasions, as well as at the present time, felt under obligation to bring before the public in such ways as he could command.

The general outline of the system proposed is as follows.

The City is divided into Six Fire Districts, which are represented on the map annexed, namely,—I, North ;—II, West ;—III, Centre ;—IV, South ;—V, South Boston ;—VI, East Boston.

The Central Office of the System of Alarms, is established in the City Hall, in charge of the fire or police departments. At this Office the main battery is placed, by which all the communications between distant points in the City, for the purposes of signalizing or alarm, are made.

Connected with this battery are two circuits of wires or classes of circuits, proceeding through the City ;—
Red First, a *Signal Circuit*, by which the number of the District in which a fire takes place may be signalized to the Central Office from any part of the City. This is represented by the red lines on the map. Second, an
blue *Alarm Circuit*, by which the operator at the Central Office may strike simultaneously on all the City Alarm Bells, and repeat at will, the number of the District in which the fire exists. This is represented by the blue lines on the map.

At each signal station, of which the number may be

multiplied at pleasure throughout the City, there is a signal key, which, whenever it is depressed, strikes a bell and makes a permanent mark on a fillet of paper, at the Central Office. The number of the district is thus easily communicated. The signal key itself is in a locked case, in the charge of a person or persons in the neighborhood of the station.

At each Alarm Bell, in connection with the Alarm Circuit, there is a receiving magnet, which completes the circuit of a small local battery, at the moment of the completion of the Alarm Circuit by the depression of a key at the Central Office. The local circuit, thus completed, includes an electro-magnet with its armature, which is brought into action at the moment of the passage of the main current, and which liberates a train of wheels, carried by a weight, causing a hammer to strike a blow of any required force upon the bell. The operator at the Central Office is thus enabled, by depressing the alarm key, to strike the number of any district simultaneously on all the alarm bells.

An experimental striking apparatus of this kind was constructed for, and now belongs, it is believed, to the City which, with slight repair, would exhibit this action in a satisfactory manner.

The mode by which an interruption of the circuit, or the communication of an unauthorized alarm, is rendered almost impossible in the system proposed, is by the connection of each station with the Central Battery, by two different routes, with a provision for the frequent testing of the circuit, and by the separation of the wires to such a distance that a cross connection between them can not be effected.

The cost of the construction and erection of all the parts of this system, providing for the establishment of

a signal station at every engine house and alarm bell, now used, and for the mechanical connection of all the present alarm bells with the telegraph, is estimated at $7,959. 60.

The details of the System, and of the estimates of its original and annual cost, with the considerations chiefly affecting its value, are presented in the annexed papers.

The undersigned, believing that the economy and security of such a system will be readily appreciated, and that it will command the favorable testimony of scientific and practical men, respectfully asks for it the consideration of the City Government.

WM. F. CHANNING.

Boston, March 24, 1851.

SYSTEM OF TELEGRAPHIC FIRE ALARMS.

THE DISTRICTS.

The number of the Districts represented on the map, has been chosen as sufficient to localize a fire, without unnecessary complication, and also as agreeing with natural divisions of the City. The number may be increased or varied, if thought desirable.—East Boston, not upon the map, constitutes a sixth district.

THE CENTRAL OFFICE.

The Central Office, at the City Hall, contains the main battery of 100 pairs of Grove's arrangement, of which, perhaps one half are always in connection with the circuits, requiring only the depression of a signal or alarm key to be called into action. The remainder are to be used alternately, or as a reserve, when the solutions are changed. The South Boston circuits are distinct from those of the City Proper. The City Proper will be found to arrange itself naturally into two divisions of circuits, one north and one south, which may be united, or connected with separate portions of the main battery. Though these circuits are all very short yet the number of receiving magnets in the City Proper,

included in the circuits, connected with the alarm bells, is so great,—being 8 in the north circuit and 10 in the south circuit, — that considerable resistance would be introduced, and upon these circuits the principal part of the battery power would be expended. The signal circuits would require very few cups as the receiving magnet at the Central Office is the only one included in them. The signal battery might be distinct, though it could with greater economy be connected with both signal and alarm circuits, as only one circuit or class of circuits is in operation at a time except in rare cases. If a second alarm should be communicated to the Central Office while the first was being signalized upon the bells, the signal circuit would still act independently. "Switches," by which the connections of the battery, or of different parts of it, could be instantly changed, would also be placed in the Central Office. The arrangement of the battery and circuits will readily be understood by any intelligent Telegraph operator.

In connection with the signal circuit a receiving magnet is placed in the Central Office, which opens and closes a local circuit of two or three galvanic pairs coincidently with the flow of the current in the signal circuit, produced by the depression of one of the signal keys at a distance. This local circuit causes an alarm apparatus to strike a single blow on a bell, and it also actuates one of Morse's registers, by which a permanent mark is made at the same moment on a moving fillet of paper. Attention is thus called to a signal, and it is also permanently recorded.

The same register, or a separate one, may with advantage be included in the alarm circuit, so that, every time that the bells are struck by their hammers, it will re-

ceive a mark. By keeping such an account, at the Central Office, of the action of the striking machinery, it can readily be told when the weights require to be wound up, which may be once in two or three days or two or three weeks, according to the number of fires.

As a means of striking the alarm bells of the churches with regularity, the operator may depress the alarm key at intervals of two, three, or any other number of seconds, measured by the swing of the pendulum of a clock,—allowing twice the interval between successive signals. A preferable mode is however to employ an instrument, moved by clock work, having six keys,—on depressing any one of which, a spring bears on a revolving cylinder, so made, as to complete and break the circuit at regular intervals, the requisite number of times for the corresponding district, allowing double the interval between successive signals. As long therefore as the key, representing a district is held down, the alarm bells will continue to strike, in succession, and at proper intervals, the signal of that district. This apparatus is well known in connection with the electro-magnetic telegraph.

THE CIRCUITS.

As the "completion of the Circuit" is the condition of calling the battery into action, and of obtaining the effects of its current, the Signal Circuit is so arranged that it may be completed, by depressing any one of the signal keys, placed at the several signal stations; and the alarm Circuit is so arranged, that it may be completed by depressing the alarm key at the Central Office.

The ground is not used as any part of either Circuit, as it would afford facilities to unauthorized persons to complete the Circuit by establishing connection between

the wires and ground. By this means also, the ground is left as a reserved conductor, by which, in connection with one of the signal wires, intercourse may be held between different parts of the City, as for example between the public buildings at South Boston and the City Hall,—a ground connection being made for the moment with the central battery, or, preferably, with a few pairs, detached from it, by means of a "switch." The fullest telegraphic correspondence can thus be held with public agents at any station, where a register is placed, without interfering with the signalizing action of the wires in case of fire.

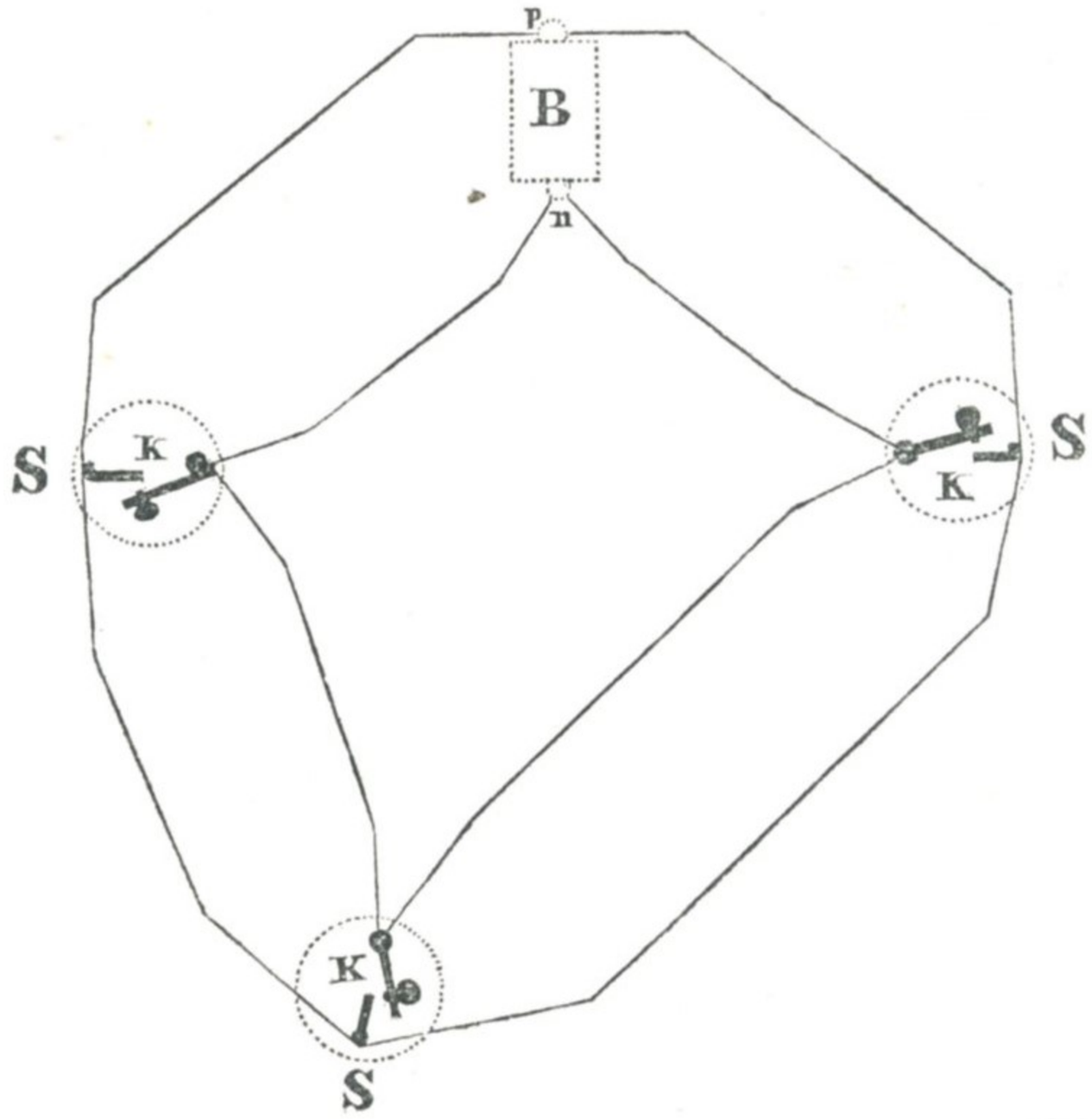
In the Signal Circuit two wires, one connected with each pole of the battery, pass through each signal station and any connection between these wires, as by means of the signal key, completes the Circuit. Between the stations, these wires as well as those of the Alarm Circuit, diverge, leaving, where it is practicable, several hundred feet between them. The wires belonging to different Circuits also alternate with each other where this can be advantageously effected. It would therefore be almost impossible for any unauthorized person to complete either Circuit by means of a cross connection. The wires of the same Circuit only approach at the signal stations, and as these are frequently churches or high buildings, the wires may make a stretch of four or five hundred feet, or even more before touching another building. In the case of low buildings, such as some of the engine houses, unless there were other high buildings within reach, the wires might if thought necessary, be raised on a flag staff, from the top of which they would diverge in different directions.

To avoid possible interruptions of the Circuits, they are made in every case two-fold; that is, each station,

whether for signal or alarm, has two connections with the battery by separate routes. If one wire should be interrupted by accident or design, the other will still complete the Circuit. By the frequent testing of the wires between the stations, in the mode commonly practised, in connection with the telegraph, the continuity of *all* the wires may be habitually preserved. The continuity of all the separate Circuits can also be frequently tested at the Central Office, without difficulty in the case of the signal wires, and, in the case of the alarm Circuit, with such rapidity as probably to avoid striking a bell.

The security of the mode of communication by telegraphic wires, carried through the City, is not at all appreciated. It is stated that the wires of the House line of telegraph in this City, during a period of a year and a half, have only been interrupted twice,—in both cases having been broken by snow falling from the tops of houses,—and that the wires of the Bain line of telegraph in the City, have only been broken once by workmen employed in constructing a building, with which the wires interfered. The security of the wires of the House line, during that time, in a single stretch of 800 feet, between the towers of the Chauncy place and Essex street churches is also instructive.

The connection of the wires of the signal Circuit is shown in the annexed diagram.

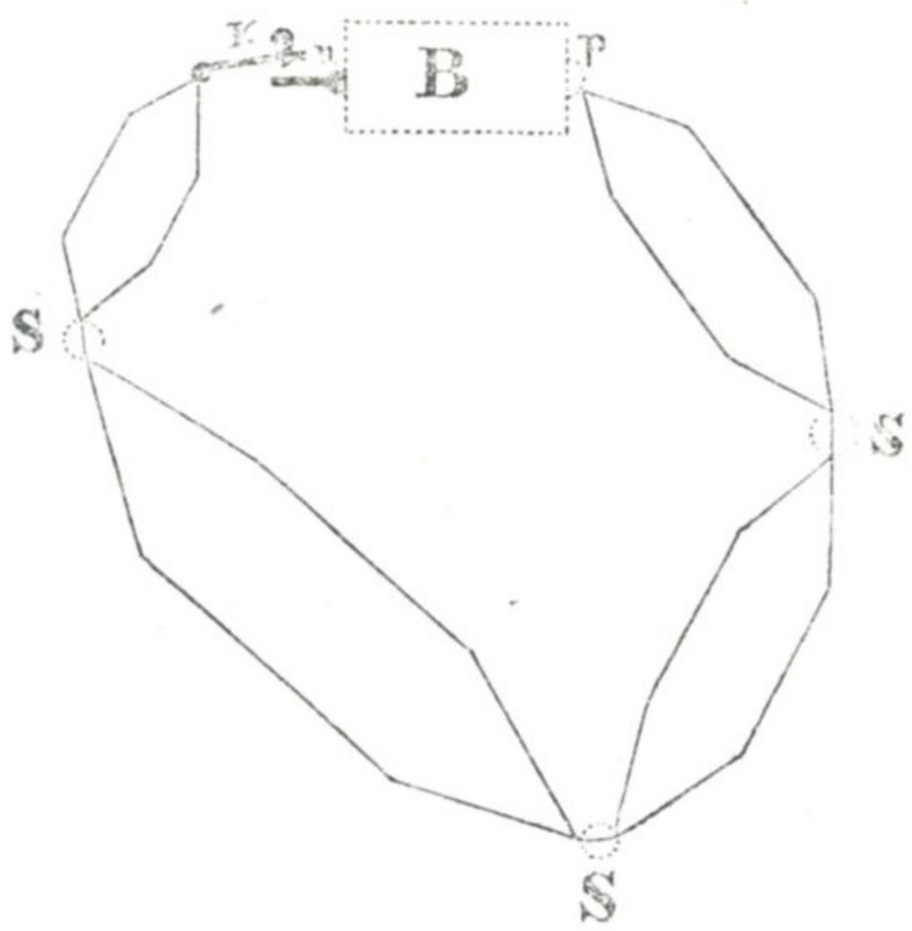


S

Let *B* represent the battery at the Central Office, *p* and *n*, its positive and negative poles. It will be seen that the signal wire represented by the black line proceeding from each of these poles, makes a complete circuit, returning to the pole from which it started, and with which it is constantly connected. Each of the wires are represented as passing through three stations, *S*, *S*, *S*, and diverging or separating between. At any one of these stations the Circuit between the two poles of the battery may be completed, by depressing the signal keys K K K. Now if either or both of these wires should be interrupted in any one place, each of the three signal stations would still be in connection with the battery by one or the other end of each wire. The arrangement of this Circuit does not furnish such a number of chances against interruption as that of the alarm Circuit, but still the security is almost absolute, especially as the continuity

of each signal wire may be tested frequently at the Central Office, for its whole extent.

The connections of the Alarm Circuit are shown in the annexed diagram.



Let B represent the battery, *p* and *n* its positive and negative poles. The Circuit of double wire, united at each station S, S, S, but diverging between, is represented by the black lines. This Circuit, in the diagram, is permanently connected with the positive pole *p*, and the only break occurs at the alarm key *k* near the negative pole *n*, within the Central Office. When the key is depressed, the current passes round the entire Circuit. In this case, either of the two wires between each and every station may be interrupted, and still the Circuit will be unimpaired.

The wire used for these Circuits is of the best Swedish iron, weighing 400 pounds to the mile. This wire, or rather, small rod, has great tenacity, and can not easily broken by accident, or by design, without a deliberate attempt and resort to instruments.

SIGNAL STATIONS.

The whole of the machinery at the signal stations consists of a signal key, placed in a small locked case. A notice to the following effect should be placed upon the door of the building, " Alarm Station.—In case of Fire the key may be found at " —— &c. The watchmen at night would also have access to these stations, either to signalize a fire, or, by a special signal, to notify any disturbance.

THE ALARM BELLS.

At each Alarm Bell Station, there is a "receiving magnet,"—connected with the alarm circuit,—which closes or completes the local circuit of a small constant battery of two or three pairs, coincidently with the completion of the alarm circuit, by the depression of the alarm key at the Central Office. This local circuit induces temporary magnetism in a U electro-magnet, the armature of which is thus attracted towards the magnet. This armature is placed on a lever beam connected with a powerful striking apparatus, moved by a train of wheels and weight. The motion imparted to the armature and lever-beam liberates the hammer and allows it to strike a blow.

The helices of the "receiving magnets," used at the alarm stations, should be made of coarser wire than those used on telegraph lines, which extend several hundred miles. In the alarm circuits, of which the longest is less than four miles, a less intense current than that of the common telegraph may be used, unless great resistance is introduced by the coils of the receiving magnets themselves. The coarser therefore the wire of these helices, consistent with the performance of their

proper function, the greater will be the amount of the battery current which is able to traverse and act within the circuit.

A power equivalent to three quarters of a pound, acting through the distance of a quarter of an inch, is sufficient to liberate the hammer of the Old South Clock, and would probably be sufficient to liberate a hammer striking a blow with a force equal to that of the tolling hammers, commonly used in connection with the church bells. This power could be obtained directly from the electro-magnet actuated by the local battery, but economy of battery power at the alarm station requires that an intermediate spring or weight should be touched off by the lever of the electro-magnet, which in its turn should liberate the striking motion. This is very simply and effectively accomplished in the experimental instrument, already referred to, which is stated to have been constructed for the City by Mr. M. G. Farmer, subsequent to the recommendation of Hon. Josiah Quincy, Jr. With slight repairs this instrument can be used at the present moment to exhibit the principle of this application. It is adapted to a small bell, the size perhaps of that upon the Court House. For actual use, a striking apparatus with a more extended train of wheels and greater distance between the pins which lift the hammers would be required. An estimate of a striking apparatus of thorough workmanship, of the two sizes, which would be requisite for the City Alarm Bells, is presented in another connection, obligingly made by Mr. F. Kemlo, the City Clockmaker. A portion of this apparatus, differs only from the striking movement of the church clocks, in that it is adapted to strike but a single blow, each time that the circuit is completed.

The constant battery used at the alarm station con-

sists of three cells of the form known as the "odds and ends battery," with large platinas, of the construction of Daniel Davis of this City. This battery remains in good action for several weeks, when only occasionally used, which is an essential requisite for the batteries at the local stations. It would be important in using this battery to employ an intermediate arrangement to set off the striking machinery, like that in the instrument contrived by Mr. M. G. Farmer, belonging to the City.

The apparatus at the alarm bell station will admit of desirable simplification, if it shall be found on experiment, that the instrument of Mr. Farmer, or any similar instrument, can be operated efficiently, under all conditions, and at the number of stations proposed in a single circuit, by the direct current of the main battery. The local battery and receiving magnet will thus be avoided, at the expense of a slight increase in the main battery. The most difficult case has been considered and provided for in the description already given. The mode indicated in this connection, will, of course, be adopted if practicable, on a large scale. Should the number of telegraphic alarm bells be reduced much below those now employed, or should fewer bells be included in a single circuit, the mode here suggested will undoubtedly be applicable.

THE MAP.

The map which is annexed represents, by numbers, the fire districts, excepting East Boston, for which no telegraphic communication is provided. An alarm of fire may be signalized across from East Boston in the mode now employed, or any other mode, and then be communicated to the central office through the nearest signal station, which would be the engine house of

No. 15, on Commercial street, or the Hanover and Clark street church;—or a circuit of wires might be sent through Charlestown and Chelsea, to bring the East Boston district into immediate telegraphic communication, if this should be thought advisable.

The adaptation of the telegraph to the alarm bells and stations already existing, and with which the public are familiar, it will be seen, has been made an important part of the system proposed.

The natural division of circuits into North, South, and South Boston, (which may be connected with the battery at the central office, as either one, two or three circuits,) will be seen on the map. The Signal Circuit of double wires, represented by the red lines, and connected as in the diagram on page 14, passes through all the engine houses and present alarm bell stations, except where two happen to be united or near together. Twelve signal stations are thus provided in the North Signal Circuit of about 3 1-5 miles;—eleven in the South Signal Circuit of about 4 1-4 miles;—and three in the South Boston Signal Circuit of about 5 1-4 miles, one of which is at the buildings of the City Institutions;—being a total of twenty-six Signal Stations.

This number may be increased indefinitely at the expense of about five dollars for the apparatus and attachment at each signal station, and of one hundred and twenty-two dollars for each mile of additional signal circuit. The school houses might be used advantageously for this purpose. There is obviously the want of a signal station on the map, in the neighborhood of State and Broad streets, which would be included in the signal circuit between the Old South and Purchase street churches. The signal stations provided, are neverthe-

less considerably more numerous than the alarm bells at present existing.

The Alarm Circuit of double wires, represented on the map by blue lines, and connected as in the diagram on page 15, passes through all the present alarm bell stations,—(according to information from the Chief of the Fire Department,) including also Park Street Church. This circuit it will be observed, is sometimes left by the Signal Circuit, which passes through intermediate stations. Eight alarm bells are thus provided in the North Alarm Circuit of about 2 4-5 miles ;—ten in the South Alarm Circuit, of about 4 miles ;—and two in the South Boston Alarm Circuit of about 4 miles ;—making a total of twenty Telegraphic alarm bells.

It will be seen that the stations are connected on the map, by black lines, on which the distances are marked. In estimating the length of the actual circuit ten per cent. has been added, as an ample allowance for the curvature or divergence of the wires on the system proposed and represented.

The distances between the stations, and the direction of the circuits, are represented in the following tables.

NORTH SIGNAL CIRCUIT.

	Feet.
City Hall to Lafayette, No. 18, Engine House, Tremont row,	830
to Brattle Street Church, - - - - - -	550
to Boston, No. 15, Engine House, Commercial st., - -	3,000
to Hanover and Clark street Church, - - - -	585
to Washington Hydrant Co. No. 1, Salem street, - -	854
to Endicott and Cooper st. Church, - - - - -	483
to Hancock, No. 10, Engine House, Friend st., - - -	695
to Melville, No. 13, Engine House, Leverett st., - -	1,762
to Lynde st. Church, - - - - - - -	1,135
to School House, Pinckney and W. Centre sts. - - -	1,474
Amount carried forward, - - - - - -	11,368

	Feet.
Amount brought forward, - - - - - -	11,368
To Charles st. Church, near Cataract No. 14, Engine House, - - - - - - - - -	746
to the turn, corner of Park and Beacon sts., - - -	1,957
to Park st. Church, - - - - - - - -	440
to City Hall, - - - - - - - - -	877
	15,388
Add ten per cent. for divergence of wire, - - - -	1,538
Length of North Signal Circuit, (Wire) 3 miles, 1,086 ft.=	16,926

SOUTH SIGNAL CIRCUIT.

City Hall to Old South Church, - - - - -	432
to Purchase and Pearl st. Church, - - - - -	1,720
to Dr. Young's Church, Summer st., - - - - -	1,423
to Extinguisher, No. 20, Engine House, East st., - -	885
to Washington and Castle st. Church, - - - -	2,763
to Franklin School House, Washington st., Engine 12, -	1,195
to Hook and Ladder House No. 3, Harrison avenue, near Brookline st., - - - - - - - -	2,268
to Suffolk No. 1, Engine House, Suffolk st., near Canton,	1,055
to the turn at corner of Village st., - - - - -	1,950
to Church in Church st., - - - - - - -	2,192
to Hollis st. Church, - - - - - - -	1,161
to Boylston Market House, - - - - - -	924
to City Hall, - - - - - - - - -	2,462
	20,430
Add ten per cent. for divergence of wire, - - -	2,043
Length of South Signal Circuit, (Wire) 4 miles, 1353 ft.=	22,473

SOUTH BOSTON SIGNAL CIRCUIT.

City Hall to Free Bridge - - - - - -	3,983
to corner of First st., - - - - - - -	1,144
Amount carried forward, - - - - -	5,127

	Feet.
Amount brought forward,	5,127
to corner of Second and Dorchester streets,	4,644
to City Buildings,	2,660
to School House Broadway, near Mazeppa No. 17 Engine House,	3,627
to Church corner of Broadway and A st.	3,152
to Old Colony R. R. Bridge,	1,271
to crossing at Lehigh st.	669
to City Hall,	4,313
	25,463
Add ten per cent. for divergence of wire,	2,546
Length of S. Boston Signal Circuit, (wire,) 5 miles, 1609 ft.=	28,009

NORTH ALARM CIRCUIT.

City Hall to Brattle st. Church,	796
to Hanover and Clark st. Church,	2,500
to Endicott and Cooper st. Church,	1,296
to Melville No. 13, Engine House, Leverett st.,	2,051
to Lynde st Church,	1,135
to School House, Pinckney and West Centre sts.,	1,474
to Charles st. Church, near Cataract No. 14 Engine House,	746
to the turn, corner of Park and Beacon sts.,	1,957
to Park st. Church,	440
to City Hall,	877
	13,272
Add ten per cent. for divergence of wire,	1,327
Length of North Alarm Circuit, 2 miles, 4,039 feet=	14,599

SOUTH ALARM CIRCUIT.

City Hall to Old South Church,	432
to Pearl and Purchase st. Church,	1,720
to Dr. Young's Church, Summer st.,	1,423
to Extinguisher No. 20 Engine House, East st.	885
Amount carried forward,	4,460

	Feet.
Amount brought forward, - - - - - -	4,460
to Washington and Castle st. Church, - - - -	2,763
to Franklin School House, Washington st., (Engine 12,)	1,195
to Suffolk No. 1 Engine House, Suffolk st., - - -	2,010
to the turn, corner of Village st., - - - - -	1,950
to Church in Church st., - - - - - - -	2,192
to Hollis st. Church, - - - - - - -	1,161
to Boylston Market House, - - - - - -	924
to City Hall, - - - - - - - - -	2,462
	19,117
Add ten per cent. for divergence of wire, - - - -	1,912
Length of South Alarm Circuit, 3 miles, 5189 feet=	21,029

SOUTH BOSTON ALARM CIRCUIT.

City Hall to Free Bridge, - - - - - -	3,983
to corner of First st., - - - - - - -	1,144
to School House, Broadway, near Mazeppa No. 17 Engine House, - - - - - - - - -	4,116
to Church, Broadway and A st., - - - - -	3,152
to Old Colony R. R. Bridge, - - - - - -	1,271
to crossing at Lehigh st., - - - - - - -	669
to City Hall, - - - - - - - -	4,313
	18,648
Add ten per cent. for divergence of wire, - - -	1,865
Length of South Boston Alarm Circuit, 3 miles, 4,673 feet=	20,513

RECAPITULATION.

North Signal Circuit, - - - - - - -	16,926
South Signal Circuit, - - - - - - -	22,473
South Boston Signal Circuit, - - - - - -	28,009
Length of Signal Circuits, (Wire,) - -	67,408 ft.
North Alarm Circuit, - - - - -	14,599
South Alarm Circuit, - - - - -	21,029
Amounts carried forward, - - - -	35,628

	Feet.
Amounts brought forward, - - -	35,628
South Boston Alarm Circuit, - - - -	20,513
Length of Alarm Circuits, - -	56,141 ft.
Length of both Circuits, - - -	123,549 ft.
	or 23 miles, 2,109 ft.
Length of Wire employed, (double that of Circuits,) - - - - - -	247,098 ft.
	or 46 miles, 4,218 ft.

EXAMPLE OF OPERATION.

As an example of the operation of the system, taken from the map, a fire may be supposed to break out near the corner of Salem and Charter streets at the North End. The cry of fire is raised, and either a messenger is sent, or persons in the immediate neighborhood, whose own property is endangered, run to the nearest signal station, which is the Hanover and Clark street Church. Any member of the fire department near the fire, is also bound to carry the intelligence to such station, or perhaps to the station at Engine House No. 15, on Commercial street. The person in charge of the signal key is instantly summoned, and proceeds to strike the number of the district, *one*,—*one*,—*one*,—several times with an interval between. This completes, every time, the circuit of the battery at the City Hall, through the red wires, following either the route of Leverett and Charles streets, or that of Brattle street. The office alarm bell at the City Hall, strikes the number *one*,—*one*,—*one*,—and the register records permanently, single marks with intervals between. The operator at the Central Office instantly depresses his alarm key a num-

ber of times with intervals of two or three seconds between, or he holds down the key of District No. 1, on the revolving cylinder apparatus which has been described. The current from the battery flows through the North, South, and South Boston Alarm Circuits of blue wire, following either of the two channels between each station, and visiting every alarm bell in the City, the hammers of which, strike simultaneously the number, *one*,—*one*,—*one*;—and amongst others, the bell of the Hanover and Clark street Church, which begins to strike before the signal agent can even have left the building.

Suppose now that the fire has been easily subdued before the engines in the south part of the City have proceeded any great distance, or that in the opinion of the Chief Engineer, there are a sufficient number of engines on the ground. The Chief Engineer sends a message immediately to the nearest station, to communicate some signal agreed upon as signifying "all out," as for instance, the numbers *one*, *one-two*,—*one*, *one-two*,—and so on, which the operator at the central office forthwith strikes upon the alarm bells throughout the City, so that the firemen and citizens are enabled at once to return to their occupations. It is obvious that the Chief Engineer might also establish certain signals, by which any part of the fire department might be directed either to proceed to a fire or to turn back with their engines.

COST OF CONSTRUCTION.

The following is the estimate of the expense of constructing the system, as described, in all its parts.

The cost of erecting the wire is from the estimate of Mr. William W. Keith, who had charge of the erection of the wires of the House Line of Telegraph in this City.

The cost of the electro-magnetic instruments, is from the estimate made at the establishment of Daniel Davis, 428 Washington street.

The cost of the striking machinery is from the estimate of Mr. F. Kemlo, the skilful and experienced City Clockmaker.

All of the above named estimates, apply to materials and workmanship of the best character and description.

Cost of Materials and Erection for one mile of wire.

Best Swedish Iron Wire, 400 lbs. per mile, at 7 1-2 cents per lb., - - - - - - - - -	$30 00
30 Insulators, (Prof. Benedict's construction,) at 25 cts., -	7 50
30 Iron Holders, at 25 cts., - - - - - -	7 50
Blacksmith and three men, two days, - - - -	16 00
	$61 00

Estimate.

Forty-seven miles of Wire, $61, - - - -	$2,867 00
(At the Alarm Bell Stations.)	
Twelve large Striking Apparatus at $175, - -	2,100 00
Eight smaller do $125, - -	1,000 00
Twenty Electro-magnets, connected with do. at $5, - -	100 00
Twenty Receiving Magnets, at $10, - - - -	200 00
Twenty "Odds and Ends" Batteries of 3 large pairs at $10,	200 00
Carpenter's Work at 20 Alarm Stations at $15, - -	300 00
(At the Central Office.)	
100 pairs Grove's Battery, - - - - - -	150 00
1 Morse's Register, - - - - - - -	40 00
Revolving Cylinder, with Six Keys, - - - -	40 00
Office Alarm Apparatus, - - - - - -	10 00
6 Switches, at $1 50, - - - - - - -	9 00
2 Receiving Magnets, at $10, - - - - - -	20 00
2 Signal or Alarm Keys, at $2 50, - - - - -	5 00
Carpenters' and Fitting Work at Office, - - - -	65 00
(At the Signal Stations.)	
26 Signal Keys, at $2 50, - - - - - -	65 00
Amount carried forward, - - - - -	$7,171 00

Amount brought forward, - - - -	$7,171 00
Carpenters' Work at 26 Stations, at $2 50, - -	65 00
	$7,236 00
Add ten per cent. for contingencies, - - - -	723 60
Total Cost, - - - - - - -	$7,959 60

In the above estimate no charge for Superintendence is included. The estimate is believed to be a liberal one, and the cost of erection by persons who are ready to contract for the same, would not probably much exceed the amount stated, with the allowance of ten per cent. for contingencies there included.

The thoroughness and perfection of the work, is a consideration of the first importance in a system, in which uniformity of result is essential. No economy can therefore be practised or permitted in the quality or scale of the instruments and means employed. The striking apparatus which constitutes the largest item of expense, should be sufficiently powerful to strike a blow, if possible, as heavy as that of the tolling hammers connected with the common bells, and to repeat the blows with the frequency desired. A smaller or inferior apparatus should not be resorted to.

As the principle relied upon in this system is Electro-magnetic motion, it comes at once into relation with the telegraph patented by Professor S. F. B. Morse, and as instruments are commonly constructed in connection with the above telegraph, suitable for the purposes of this system, it seems desirable to employ such throughout, rather than to substitute others. The right to use such instruments should therefore be obtained by the City, and it is believed that this right will be accorded for the public use proposed, on liberal terms.

The time required to put up the wire in the City, would be two days for each mile, with a party of four men. Each of the three alarm, and the three signal circuits, could be commenced, if desirable, by a separate party, so as to accomplish in the whole, three miles per day,—which would require about 16 days for the erection of 47 miles.

The annual cost of the system in actual operation, will depend in part upon the use which may be made of agents or officers already in the employ of the City. Thus the constant watch in the central office, whose active duties are only occasional, may be some officer or officers of the police or fire department, whose presence is required for other purposes at the City Hall. Of the 26 signal agents, 20 may be the same individuals, who, it is believed, now receive from the City a small annual compensation for ringing the alarm bells. The weights of the striking apparatus may be wound weekly, except in the case of very frequent alarms, by agents who have charge of the City Clocks, and the alarm machinery may be taken care of by the same. The general superintendence of the system will, perhaps, fall under the charge of the fire, or other existing department.

The great efficiency and the great economies which the system would introduce into the fire department, in addition to the saving of time of City Officers and citizens, and the saving of property, should be considered in estimating its cost.

The annual cost of the mechanical parts of the system, may be liberally estimated as follows. The expense of the batteries is, in part from the estimate of Mr. E. B. Elliott, the able Superintendent of the House Telegraph Line in this City.

(For one hundred pairs of Grove's Battery, one-half in constant action for one year.)

Nitric Acid, 480 lbs. at 12 cents, - - - - -	$57 60
Sulphuric Acid, 240 lbs. at 2 1-2 cents, - - - -	6 00
Mercury, 10 lbs. at $1 40, - - - - - -	14 00
100 Zincs, at 19 cents, - - - - - - -	19 00

(For sixty pairs "Odds and Ends" Battery.)

Sulphuric Acid, 180 lbs. at 2 1-2 cents, - - - -	4 50
Zinc, 10 lbs. at 6 cents, - - - - - -	60
Mercury, 5 lbs. at $1 40, - - - - - -	7 00
Ten per cent. on Striking Apparatus, for repairs, - -	310 00
Ten per cent. on Electro-magnetic Apparatus, for repairs,	48 90
Five per cent. on 47 miles wire, for repairs, - - -	143 35
Annual Cost, - - - - - - - - -	$610 95

In conclusion, if by an improbable chance, one or all of the circuits of the system of alarms, now described, should be interrupted, the same mode of signalizing a fire would remain, which we have now,—that is, the ringing of the church bells,—with the addition that the persons in charge of the signal stations, where there are also alarm bells, would be instructed to ring those bells, according to the number of the district in which a fire had commenced.


1851.
Boston.
SYSTEM OF TELEGRAPHIC
FIRE ALARMS.
District Lines.
B.W. Thayer & Co's Lith.
Scale
100 Rods
COMMON
I
II
III
IIII
V
SOUTH BOSTON
Southpart of BOSTON.
Charles Street
Beacon St.
Chestnut St.
Tremont Street
Washington Street
Harrison Avenue
Boylston St.
Cambridge St.
Hanover
Commercial St.
State St.
Custom House
Fort Hill
Broadway