arches as ordinarily constructed. The principal saving, however, is in the reduced number of beams used, owing to the considerably greater span which may be made with the tile arch. The prices for the work vary, of course, with the span and number of courses, and also with the location and size of the building under contract.

The system is by no means an experimental one, as a large number of buildings have already been erected with it, and many others are in process of construction. Among notable buildings in and near New York City, employing this method, are the Mount Sinai Hospital, the Young Women's Christian Association building, the Plaza Hotel, and the two new Edison Electric Illuminating Company's buildings. The new Public Library building at Boston is also being built by the system, and some of the domed arches under construction are shown in the accompanying engraving, made from a photograph. The other engraving shows the arches in the Arion Club building at Fifty-ninth Street and Park Avenue. In the Arion Club building the arches are seventeen feet span. In the Young Women's Christian Association building there are some arches of twenty-nine feet span. The company is now erecting a building at Fifty-seventh Street and Eleventh Avenue in this city, which will have an arch of forty feet span for the roof.

With these tile arches, some very fine architectural effects are possible. Where it is desired to leave the soffit of the arch exposed, a special flanged tile can be used which shows no joints when laid. Where desired, also, enamelled tiles can be used for the soffit, of such color as the architect may desire.

The great points of excellence claimed for this type of construction, however, are cheapness and great strength. In the construction of the Boston Public Library building, a heavy iron column fell from a derrick, and went end first through one of these arches. The arch, however, was not shattered by the blow, but remained solid and unharmed except for the hole broken out where the column went through. This system of construction has been in use in Spain for a number of years, and some notable buildings have been erected by it. One which should interest factory-builders in this country is a one thousand loom silk-mill at Barcelona, 371 feet by 330 feet in size. The weaving-room occupies the whole of one floor, and its arched ceiling is supported by 336 iron columns.

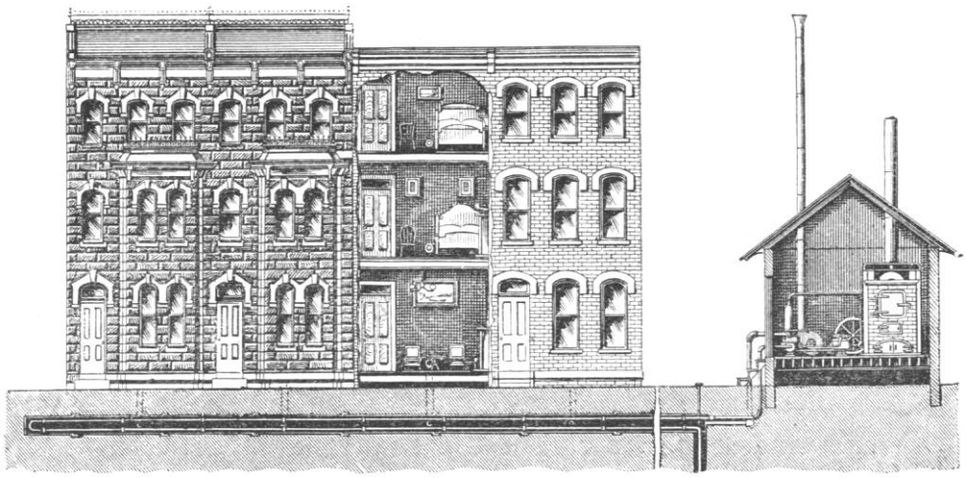
WAR-BALLOONS.

IT has hitherto been generally believed that the Montgolfier or hot-air balloon cannot be used in tropical climates. If this were true, ballooning for war purposes would of course be impossible in places where coal-gas could not be obtained. We learn from the London *Times* that Mr. Percival Spencer, who has been making a series of interesting balloon experiments in Central India, has succeeded in showing that the theory is without foundation. At Secunderabad, in presence of the garrison and a crowd of European and native spectators, he lately made an ascent in his patent asbestos balloon. The inflation was effected by the burning of methylated spirit inside the balloon, which was held in place by twenty-five soldiers of the Bedford regiment until the word to let go was given. After rising to a considerable height, the aeronaut descended by means of his parachute. The spot where the ascent was made is over two thousand feet above the level of the sea, and the achievement was all the more remarkable because of the sultry climate and the great rarity of the air.

HEAT AND VENTILATION.

To every man, woman, and child in this country this is an important and interesting subject. Science has made more progress in almost every other direction than in this, and naturally all improvements in heating and ventilating are carefully examined. The Hon. Hugh O'Brien, ex-mayor of Boston, at a public meeting and in addressing the mayors of New England, said, "In my judgment, there cannot be found in the city of Boston one single public building which could be considered as properly ventilated, and I would strongly recommend a fair and careful consideration of the Timby system of ventilating."

This Timby system is now attracting universal attention, especially in New England, and we are gratified to be able to present to our readers the plan given herewith, showing the manner in which this system is introduced. It is applied here as a street system, pure heated air being introduced into all the houses on a line of street from a centrally located plant, precisely as gas and water are introduced. Pure fresh air is received through a pipe at an elevation above the surrounding houses, and this air is driven by a fan through a conduit, and over pipes filled with hot water, at such a pressure as admits of its being distributed into all the apartments of any house on the line. This heat being regulated by a register in the various rooms, the temperature can be secured as desired. Not only can this be accomplished, but, when so desired, the air can be cooled; so that in Southern climes, or during heated terms, each house on the route can be made perfectly comfortable. So much for the street or city system.



THE TIMBY SYSTEM OF HEATING AND VENTILATING.

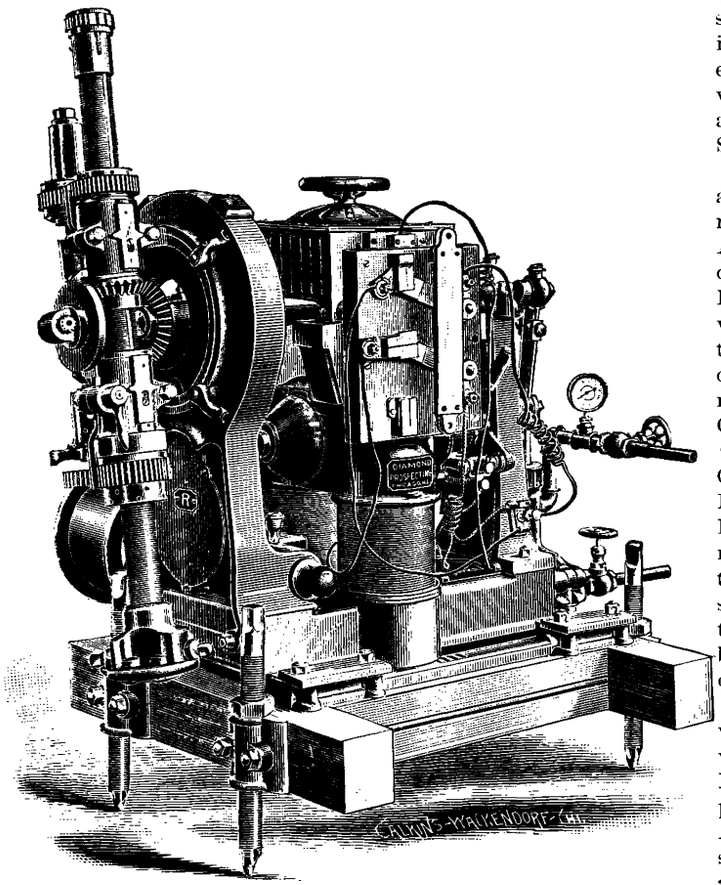
When required for a single building, say a schoolhouse, church, or hospital, the plant can be placed in the basement, and the fresh air brought from above, driven in the same manner into all the rooms, heated or cooled as desired. When necessary, a disinfectant can be used, and a block of houses, a street, or city thoroughly fumigated in a few minutes. The adoption of the Timby system for our schoolhouses will insure to every scholar the amount of fresh air changed as required, which at present is the crying want of our educational system.

With the great progress in cooking by gas, it is not unreasonable to suppose that eventually the demand for fuel for use in

our dwelling-houses will be entirely done away with. Already, within a few months past, companies have been formed, for the purpose of introducing this important and necessary invention, in Washington, D.C., Boston, Mass., and Portland, Me ; and others are in process of organization in Providence, R.I., New York City, and Hartford, Conn. Parties wishing information on the subject can address the secretary of the New England Heating and Ventilating Company, 85 Water Street, Boston, Mass.

AN ELECTRICAL DIAMOND-DRILL.

THE electric motor is rapidly winning an important place for itself in mining operations. Already there are electric coal-cutting machines, electric hoists, electric mine locomotives, and electric drills, some of which have been described and illustrated in these columns. One of the latest devices in this



AN ELECTRICAL DIAMOND-DRILL.

line, the Sullivan electric diamond-drill, operated by a Thomson-Houston motor, is shown in the accompanying illustration. In the form shown, the drill is intended mainly for prospecting, though of course it is equally well adapted to underground work. One of the difficulties heretofore encountered in using diamond-drills in underground work, as well as in prospecting where the ground is rough or mountainous, has been that of getting power to operate the machine. By the use of electric power, however, this difficulty is entirely overcome. The dynamo may be located at any convenient point, and the current transmitted to the drill by insulated wire in the usual manner.

This machine is compact, occupies but little space, and may be operated by any intelligent workman. It will drill a hole to a depth of three hundred feet, and in any direction, the drill being fed forward by a friction feeding device at a speed proportioned to the hardness of the material operated upon. The machine is manufactured by the Diamond Prospecting Company of Chicago.

THE ELECTRIC-LIGHT CONVENTION.

THE eleventh convention of the National Electric-Light Association was held at Kansas City, Mo., on Feb. 11 to 14, the sessions being held in the Coates Opera House. When the convention was called to order by the president, E. R. Weeks, there were about one hundred and fifty members and guests present, the attendance increasing to three hundred before the convention ended. After an address of welcome by the mayor of Kansas City, President Weeks briefly reviewed the growth of the association, and outlined the programme arranged by the executive committee. The rest of the session was taken up by routine business.

On the 12th the committee on the abolition of duty on copper presented its report, and recommended that all members place themselves in communication with their respective members of Congress, with the view of securing the removal of the duty on copper. The committee on standardizing potentials on electric street-railways and that on harmonizing insurance and electrical interests presented reports, which were full of interest, and evoked considerable discussion. The papers read at this session were one on central-station construction, by C. J. H. Woodbury, and one on the history and theory of the steam-engine, by F. E. Sickel.

On Thursday the 13th, after the reading of communications and action thereon, George E. Palmer read a paper on the economic generation of steam, written by George H. Babcock. After this and the papers of the previous session had been discussed and commented on by the members, a paper entitled "A Recent Edison Central Station and the Results thus far obtained" was read by C. J. Field. This paper brought out a long and interesting discussion. T. Carpenter Smith followed with a paper on a universal system of central-station accounts. At the afternoon session the following papers were read and discussed: "The Cost of the Products of Central Stations," by A. J. DeCamp; "Nine Years with the Arc-Lamp," by M. D. Laws; "Arc-Light Carbons," by E. F. Peck; "How our Paths may be Paths of Peace," by H. W. Pope; and "Safety and Safety Devices in Electrical Installations," by Professor Elihu Thomson. The report of the committee on data was then received, and a resolution adopted petitioning Congress to authorize and direct the superintendent of the census to collect certain data in relation to the electrical industry in addition to that already provided for by law, and asking for a special appropriation of fifty thousand dollars to carry on the work.

On Friday, the last day of the convention, the following papers were read and discussed: "Electricity as applied to Street-Railways," by F. J. Sprague: "Prodigality in Economy," by C. C. Haskins: "Line Insulation from the Standpoint of Practical Experience," by C. A. Harber: and "How to locate Grounds on Arc-Light Circuits," by J. E. Lockwood. At the afternoon session, after an exhibition of and address upon the phonograph and graphophone, by E. H. Johnson, committees were appointed on the revise of the by-laws and constitution of the association, on underground conduits and conductors, and on the relations between parent companies and sub-companies.

The officers for the ensuing year are as follows: president, M. J. Perry of Providence, R.I.; first vice-president, E. A. Maher, Albany, N.Y.; second vice-president, C. L. Edgar, Boston; executive committee, C. R. Huntly (Buffalo, N.Y.), chairman, E. R. Weeks (Kansas City), James E. English (New Haven, Conn.), J. J. Burleigh (Camden, N.J.), M. D. Law (Philadelphia), M. J. Francisco (Rutland, Vt.), A. F. Mason (Boston), J. A. Seely (New York), H. K. Thurber (New York). The semi-annual meeting next August will be held at Cape May, N.J.

During the four days of the convention there was an extensive collection of electric apparatus on exhibition in Casino Hall, near the headquarters of the association. The hall was brilliantly illuminated by both arc and incandescent lights, and the attendance was good. Electric motors of various sizes were exhibited by the Sprague, the Crocker-Wheeler, and the C. & C. motor companies of this city, the Elektron Company of Brooklyn, the Detroit Motor Company of Detroit, the Baxter Company of Bal-