forced by four 1 1-2 inch rods from first to fifth floor. The interior columns vary from 20 by 20 inches in the basement to 12 by 12 inches in the fourth storey, and the reinforcement varies from four 2 inch rods to four 3-4 inch rods tied together every 12 inches by 1-4 inch ties and connected at each floor by gas pipes 3 feet long, filled with grout. The columns adjacent to the old building had to have cantilever footings similar to the wall plates in the old building. The columns divide the building in nearly square panels, which are divided up by the girders from 15 to 16 feet apart in both directions. Half the number of all rods in girders were bent up and extended into the adjacent girders for from 18 to 24 inches. Stirrups were of 1-4 round steel and from 4 to 12 inches apart.

The third storey ceiling was suspended from the fourth floor and had to be strong enough to carry a weight of 50 pounds per square foot in order to support the many cables placed between the ceiling and fourth floor to reach the automatic connecting machines placed on the fourth floor.

The operating room in the fifth storey is about 50 by 170 feet and necessitated spans in the sixth floor 50 feet long, in the annex and over the old portion. As another storey is to be added to the building these girders have to carry also the future sixth storey and roof. They were figured as an arch without hinges and therefore the steel rods in the outside pilasters were bent up into the lower part of the beam. The girders are 15 inches wide and 48 inches deep and reinforced by from eight to ten 1 3-8 inch rods, 56 feet long, bent into the columns to follow the line of stress. The lintel at the sixth floor was made 4 feet 5 inches deep in order to tie the frames well together, as earthquakes are not of so very rare occurrence in Utah. A temporary wooden roof covered by a composition roof was built over the sixth floor, which also contains a blue print house for the company's use, built of metal lath and plaster walls and roof.

The floors have a 2 1-2 inch cinder concrete finish in which the gas and electric pipes were imbedded and the linoleum was directly pasted on the smoothed cinder concrete.

A ventilating flue at the outside of the building was built 3 feet 6 inches by 7 feet 8 inches inside dimension, and 125 feet high, with 6 inch concrete walls reinforced by 7-16 inch rods 12 inches c. to c. in both directions.

At each floor in the rear of the building were reinforced concrete fire-escape platform cantilevers from each floor for 6 feet 6 inches. The stairs were also of reinforced concrete. The inclined slabs, including the necessary column and girder construction, were built together. The floors and the steps proper were built afterwards in special moulds and of marble chips and cement, which were rubbed to produce a slight polish and to imitate granite. They were afterwards placed in position like stone steps.

The concrete pilasters in the exchange room represented the most difficult task of the whole job. The exchange board, about 70 feet long and 6 feet high, was parallel to the north wall of the old building and only 27 inches away from it, while the new concrete pilasters were 25 inches deep. Any accident to the board, caused by heavy shocks or by surplus water coming on the floor or through cracks, would have disabled thousands of wires and caused tremendous losses. As it was impossible to brace the column forms in the exchange board, expansion bolts were fastened to the walls on both sides of the form, from 18 to 24 inches apart in vertical direction, and the forms wired to the bolts by means of No. 8 wire. The cracks were closed by battens and oakum, and the concrete was mixed rather stiff, and only two feet of the column was concreted at a time. As the concreting of the north side pilasters could not be carried on by bringing the concrete into the various offices or exchange rooms, thereby spoiling floor and furniture, it had to be poured from the fifth floor through 8 inch collapsible sheet iron tubes, often for a height of 50 feet. This of course caused a tremendous noise in the exchange room, which could be heard through the phones all over the city, and for this reason was carried on about midnight.

Much of the outside work was laid in freezing weather and in times of snowfall. The snow was shoveled out of the girder forms, boiling water poured into the forms to heat the wood and especially the steel rods. The concrete was mixed with boiling water, which took the frost out of the sand and the crushed gravel; a number of salamanders were kept going day and night, and the forms were sprinkled from the underside to prevent baking of the concrete in the state of setting. The tops of the floors were protected by boards and burlaps.—The Engineering News.

THE USE OF CONRETE IN FREEZING WEATHER.

Concrete may be mixed and placed during freezing weather with perfect safety, provided certain conditions obtain or certain precautions are taken.

In mass work, where only relatively light loads will come upon the concrete until such time as it has had an opportunity to thaw out and reharden, and where the superficial appearance is of no importance, no precautions need be taken to prevent freezing.

In cases where freezing must be prevented until at least the initial set has taken place, three different methods may be used separately or in combination, viz.:

(a) The concrete aggregate may be heated, or hot water or steam may be used in the mixing. This hastens the set.

(b) Sodium chloride, calcium chloride or other chemicals may be added, so as to lower the freezing point of the water.

(c) The work may be enclosed and the interior of the enclosure maintained above a freezing temperature until the concrete set naturally.

The heating of the aggregate is always advisable so as to preclude the possibility of frozen lumps of sand or larger aggregate getting into the completed work. In one case the writer removed from a reinforced concrete column during the depositing of the concrete a lump of frozen sand which would have occupied fully fifteen per cent. of the effective column area. Even when boiling hot