

A Model Cholera Hospital at Rome.

The London *Globe* gives an interesting account of a new cholera hospital at Rome, which the Pope has caused to be built. Contact with the outer world is carefully guarded against by grated windows, telephones, and by a revolving barrel, with half its circumference open, by which provisions are taken into the hospital. The water supply is drawn from a well, and is quite separate from the city supply. The drain is formed of an iron tube, sixteen inches in diameter, the joints being hermetically sealed with lead. There is a disinfecting boiler in which corrosive sublimate is placed. There is a room called the "chamber of observation," which has a staircase leading up to the first floor. In this room dead bodies are placed for a given time, as it is well known that cholera patients often show signs of being dead when really only apparently so. The room is, by means of an electric apparatus, in communication with the director's office. The body being laid on a bed, both hands are put into a sort of copper muff; between the hands is put an instrument so sensitive that, should there be the slightest movement of the hands or any other part of the body, this instrument would instantly close the electric circuit, and the bell in the director's office would be set ringing; at the same moment another instrument registers the number corresponding to the bed upon which the body is lying. The chamber is warmed by steam, so as to facilitate resuscitation. The laboratory is provided with a gasometer for the storage of oxygen,

A UNIQUE SYSTEM OF WATER WORKS.

BY E. O. HOVEY.

As everybody knows, water is frequently raised to a desired height by means of a hydraulic ram set in a stream at the foot of a hill, or at the bottom of dam, or at some other place where there is a natural fall of water; but at Elk River, Minn., there is a peculiar arrangement, a description of which may prove to be of interest.

The town is situated at the junction of the Elk and Mississippi Rivers, thirty miles northwest of Minneapolis. The geological formation is the area of modified glacial drift of central Minnesota. About half a mile northeast of the station the railroad passes within a few yards of the southwestern edge of a tamarack swamp, in which water is found on or near the surface. For a long time it has been known that, within a limited area southwest of the railroad at this point, good water could be had at a depth of eight feet, while just outside of this area water could not be found short of eighteen feet. The idea occurred to Mr. T. S. Nickerson, who lives at Elk River, and is water supervisor of the Breckenridge division of the St. Paul, Minneapolis, and Manitoba Railroad, that a hydraulic ram might be set so as to utilize this difference of water level. Test holes twelve feet deep were sunk with an elongated post hole auger, at the points marked A, Fig. 1, to determine the location of the edge of the basin of water standing at eight feet. Water failed to come into these holes, but at the point, B, Fig. 1, water was struck at the required depth. The operations which pertained directly to the setting of the ram are of especial interest. On a line supposed to be perpendicular to the rim of the basin a ditch sixteen feet long, two and a half feet wide, and about twelve feet deep was dug to allow the water to flow off while the "supply" well was in process of construction. This well is twelve feet in circumference and twelve feet deep. The first six inches of the well and ditch were cut through the light and sandy but fertile soil characteristic of this region, the next six and a half feet through loose gray sand. Then, on the line between the well and the ditch, the diggers struck a dike two feet wide at the top, but soon increasing in width to four feet, composed of coarse sand so firmly cemented by infiltrated oxide of iron and carbonate of lime as to render the use of the pick necessary in removing it. This dike is impervious to water, and, as shown in Fig. 2, has an inclination at this point of about 75°

months ago Mr. Nickerson laid a two inch iron drain pipe from a depth of 18 feet in the waste well to a point 1,200 feet distant on the terrace of the Elk River, and the waste water is easily disposed of through this outlet.

The water within the basin is strongly impregnated with iron and has but little lime in its composition, while that from wells without the basin contains much lime and but little iron. The water from the tamarack swamp is like that found in the basin. The dike of coarse sand has been cut into at one other place, and found to trend in such a direction as to warrant the supposition that it forms a retaining wall on at least the southern and southwestern sides of the basin and tamarack swamp, thus preventing their waters from flowing off into the loose gray sand and descending to the general water level.

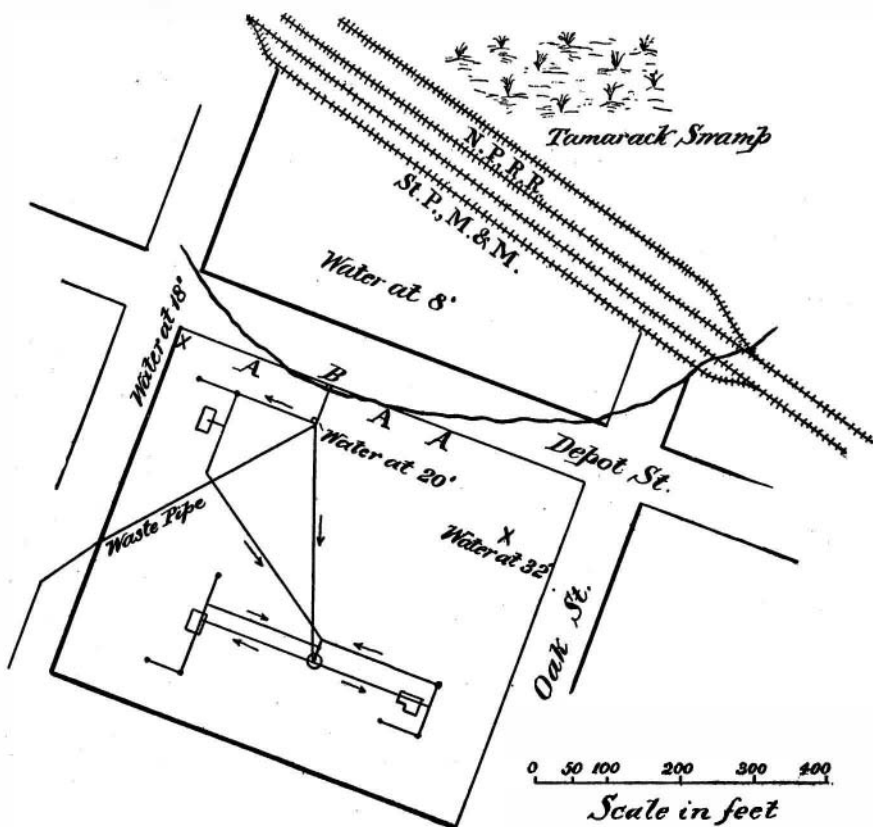


Fig. 1

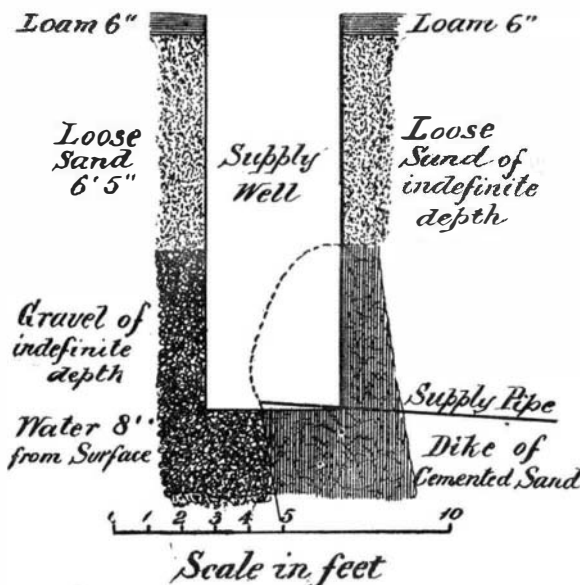


Fig. 2.

which is taken to the wards for administration in gas bags. On the ground floor are four wards for doubtful cases. Should they get worse, they are sent up in the lift to the cholera wards above, their clothes and bed linen being immediately burned. Another room is set apart for women in childbirth, and there are two more for undressing patients, so that the infected clothes may be destroyed, the Pope furnishing new clothing for all recovered cases. The cubic space allowed for each bed is thirty-six cubic meters. The ventilation is carried on by means of funnels with gas jets below. The chapel is in communication with the sacristy of St. Peter's, so as to form an easy access for the Pope, should he wish to visit the hospital; but before returning into the sacristy, his Holiness and suite would have to go into a room near it for disinfection.

Detection of Leaks in Water Mains.

The microphone is now being used in Germany for the purpose of detecting loss of water through leakage in town mains. The apparatus consists of a steel rod, which is placed upon the cock in the neighborhood of which the leak is suspected, and a microphone attached to the upper end of the rod. A dry battery and a telephone complete the equipment. No sound is heard in the telephone if the cocks are closed and no leak occurs; but a leak of even a few drops through a badly fitting cock causes sufficient vibration in the pipe to affect the microphone, and to give audible sounds in the telephone. At the recent meeting of gas and water engineers in Eisenach, it was stated that the apparatus is so simple to handle that, with a little practice, ordinary workmen are able to detect and localize any leak.

south of west. Northeast of the dike the well passed through coarse gravel containing many large stones, while southwest of it nothing but the loose gray sand was found. In the coarse gravel a copious supply of water was met with, which flowed off freely through the loose sand of the ditch.

A two and a half inch iron pipe was laid in the bottom of the well and ditch, the well was bricked up in the usual way, and the trench in the dike outside of the well was filled in with cement to make a water tight joint about the pipe and to prevent the washing away of the dike. Fifty feet southwest of this well another one, called the "waste" well, eight feet square, was sunk to the depth of twenty feet, and cased to prevent caving. Water was met with at this depth, or the well would have been made deeper. A No. 6 hydraulic ram was then placed in the waste well at a depth of 16 feet, and was connected with the two and a half inch iron pipe mentioned above. The ram here has a head of water of eight feet, and it furnishes three houses and their dooryards with an abundance of water. The arrangement of the pipes leading from the ram is illustrated in Fig. 1. Each pipe, after making the circuit of the house and dooryard which it supplies, is connected with a 250 bbl. tank, the bottom of which is 16 feet above the ground, which connection greatly increases the force of the stream at each faucet. In each pipe, after it passes through the house, there is a check valve to keep the water from flowing back from the tank through the house.

For about a year, i. e., until the present summer, the waste water from the ram found free discharge through the loose sand surrounding the well; but lately the sand has seemed to be saturated with water, and drainage has not been sufficiently rapid. Therefore, three

totally unfit for use. He then sued the coal company for damages.

The Supreme Court of Pennsylvania has given judgment against the Sandersons, and the matter is finally settled.

In the decision, the court says:

"If damages may from time to time be recovered, either in the present form or as for a nuisance, punitive sums may be resorted to to prevent repetition or to compel the abatement of the nuisance; indeed, if the right to damages in such case is admitted, equity may, and under the decisions of this court undoubtedly would, at the suit of any riparian owner, take jurisdiction, and, upon the ground of a continuous and irreparable injury, enjoin the operation of the mine altogether. . . . The defendants have done nothing to change the water or diminish its purity, save what results from the natural use of their own property. The water, as it is poured into Meadow Brook, is the water that the mine naturally discharges; its impurity arises from natural, not artificial, causes. The mine cannot, of course, be operated elsewhere than where the coal is naturally found, and the discharge is a necessary incident to the mining of it. . . . The right to mine coal is not a nuisance in itself; it is a right incident to the ownership of coal property, and the owner cannot be held for permitting the natural flow of mine water over his own land into the water course. . . . The defendants were engaged in a perfectly lawful business, in which they had made large expenditures, and in which the entire interests of the community were concerned; they were at liberty to carry on that business in the ordinary way, and were not, while so doing, accountable for consequences which they could not control."