

tested. The heads were strengthened by means of six 1 1/4 inch through braces. The cast-iron safety-valve nozzle was allowed to remain in place, but was eventually replaced by a soft patch after 300 pounds pressure had been applied and released, as the distortion of the shell under the flange of the nozzle caused leaks impracticable to calk. During the test the boiler was supported on two wooden shoes sawed to fit the curvature of the shell.

When the pressure in the boiler was increased from 300 pounds, the highest indicated on the diagrams, to 335 pounds the manhole patch ruptured. Three of the rivets were sheared by the tangential stress of the shell followed apparently by the fracture of other rivets by tension on their stems which pulled off the heads and finally tore the sheet longitudinally along its upper element, starting this fracture at a rivet hole of the manhole as shown in Fig. 6.

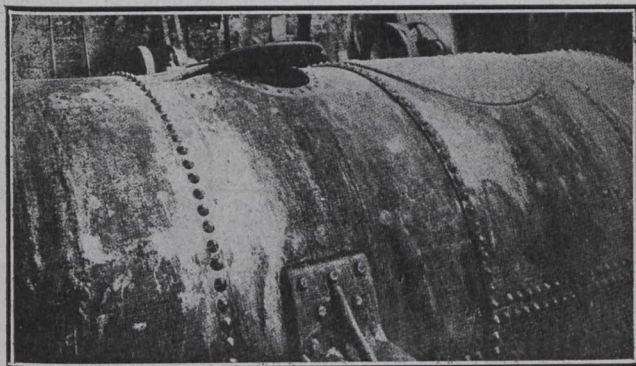


Fig. 6.—Manhole Patch After Rupture.

The shell was repaired by cutting out a portion of the middle course and putting in a section the full width of the course and about 3 feet wide measured on the arc. This was double riveted to the shell at its longitudinal seams. The hand-riveted seams extended rapidly, and copious leaks were started so that at the time of writing the paper no greater pressure than that of 335 pounds, at which the manhole patch ruptured, had been attained.

In summing up, the author points out the usual influence of longitudinal seams in intensifying the stresses in the adjacent sheets, the excessive stress developed at the side of the manhole patch and at the side of the safety-valve nozzle, and suggests that if such abnormal stresses can occur with so simple a structure as the boiler under consideration, it might be well to apply this method of examination to the strains produced in boilers of more complex construction.

**GREASE IN GARBAGE.**

Grease in garbage at Toronto was determined by a test made in January, 1911, at the works of Messrs. W. Harris & Company, under the direction of Messrs. Hering & Gregory, consulting engineers, of New York City. The object of the experiment was to ascertain by means of the reduction process the amount of grease contained in samples of Toronto garbage. Ten loads of garbage and rubbish, having a total weight of 11,075 lbs. were delivered at the works. This material was sorted over and the rubbish removed from it, leaving a net weight of 8,823 lbs. The garbage was then subjected to the reduction process and it was found from the results and analyses that the total amount of grease was about 4.71 per cent. of the weight of garbage. It is impracticable to recover all of the grease, but it is stated that by the use of the naphtha process the total amount of grease which could have been recovered would have been about 4 per cent. of the weight of the garbage.

**COST ANALYSIS FOR CONTRACTORS.**

The American Society of Engineering Contractors has for some months been working upon a uniform system of cost analysis for contractors, a committee having been appointed and discussions having been held at the monthly meetings of the society in New York and by some of the sections of the society in other cities. The subject has been freely discussed at these meetings by many contractors and a certain amount of progress is apparently being made. At a meeting in New York Edmund A. Pratt, under the title "A Simple Form of Cost Analysis," presented a form dealing with reinforcement in concrete work. This was somewhat modified by the discussion which followed, the resulting form being that shown herewith. The form presented is not intended to be kept in the field, but in the office, containing the results and total of records kept in the field. It seemed to be the general idea that the most convenient size for the form was that of the ordinary letter head, as it made it convenient for filing and for reference. As indicating the general ideas of the members concerning the subject of cost analysis we quote certain remarks from the minutes of that meeting as published in the September number of the Journal of the society:

**Secretary Wemlinger**—Although we have become acquainted with many and various systems and forms for cost keeping and cost analyses, few of such are sufficiently simple and convenient to become available for general use. It is our aim, therefore, to determine what features, classifications, items or subdivisions are desirable or necessary in cost analysis blanks, so that the engineering contractor who needs to study his costs can readily do so by using some of the standard forms and methods recommended and adopted by the society.

**Mr. Lockwood**—Concerning cost-keeping systems there is always danger of too much detail. In a certain shop a very elaborate system was put in to revolutionize the work and to show how much the owners were losing. At the end of the year they had lost \$30,000; the system was so complicated with minute detail that it took half the time of the men to fill out cards.

**Mr. Smith**—There is a weekly time card that I saw one contractor use, something like that illustrated below:  
Foreman, F. C. Burke.  
Laborer, John Angelo.

Day.	7	8	9	10	11	1	2	3	4
Monday	A		C		D	C			A
Tuesday	B								
Wednesday	D	E		A		D			C
Thursday	C								
Friday	E					D			
Saturday	B	A		B			E		C

At the top of the card is written the foreman's name and the name of the laborer. The first column is for the day, there being six spaces, one for each day of the week. Across the top, under the names, are printed the working hours. In the morning the foreman would take the card for each man and write a capital letter to indicate the class of work that the man was working on; later, say nine o'clock, if he changed him to another class of work, he would write another letter in the column 9. Every time the workmen were put to work on some other part of the job the proper classification letter was entered in the time column. . . . The foreman took the cards from the men every morning at seven o'clock and kept them in his pocket until noon, when he handed them back to the men. Then at one o'clock he took the cards back and entered the proper classification of work for each man. At five o'clock the cards were handed back to the men, and the whole thing repeated each day.