

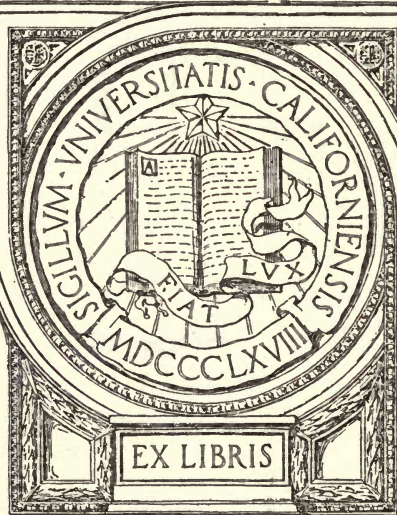
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DEPARTMENT OF CERAMICS

R. T. STULL, Acting Director

DESIGNS OF SEVEN TEST KILNS

BY

R. T. STULL AND R. K. HURSH

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DESIGNS OF SEVEN TEST KILNS

BY R. T. STULL AND R. K. HURSH, URBANA, ILLINOIS

In presenting the designs of these test kilns, no claims are made to original ideas. In the design of each kiln, an attempt has been made to combine well-known principles in such a manner as to best meet the conditions and requirements which the kiln is to meet.

All flues leading from the kilns are placed under the floor. These connect with two main flues 15 in. wide by 30 in. deep, which in turn connect with a 60 ft. stack. Kiln represented by Figs. 1 and 2 is of the down-draft, open fire type, provided with two fire boxes. The fire boxes are short and wide, facilitating easy cleaning and prolonged life of grate bars. The kiln is provided with a flue system so that forced draft may be applied either above or below the grates. The kiln has been in use over two years and has been fired repeatedly to cone 16. It has a surplus of draft so that it has not been necessary to use forced draft to reach high temperatures.

In Figs. 3 and 4 is shown a rectangular down-draft muffle kiln. The muffle is 2 ft. by 3 ft. and 3 ft. to the spring. The muffle walls are laid with hollow blocks beveled at the corners in order to give greater radiation surface. The same size and style of fire box is used in this kiln as in the former one. The kiln has been burned to cone 8 in twelve hours. After two years of use, it is in excellent condition.

Figures 5 and 6 represent a round down-draft open fire kiln. Fuel oil, delivered to the kiln under 5 lbs. pressure, and air at 2 lbs. are used in firing. The four burners lead tangentially into a combustion ring. The fire gases pass up over a circular flash wall and down through the perforated floor.

The crown is removable and is raised and lowered by a three ton chain hoist running on a track. This arrangement permits of easy and quick setting and eliminates the troublesome cold doorway. The temperature and kiln atmosphere can be governed very closely. The kiln has been in use for more than a

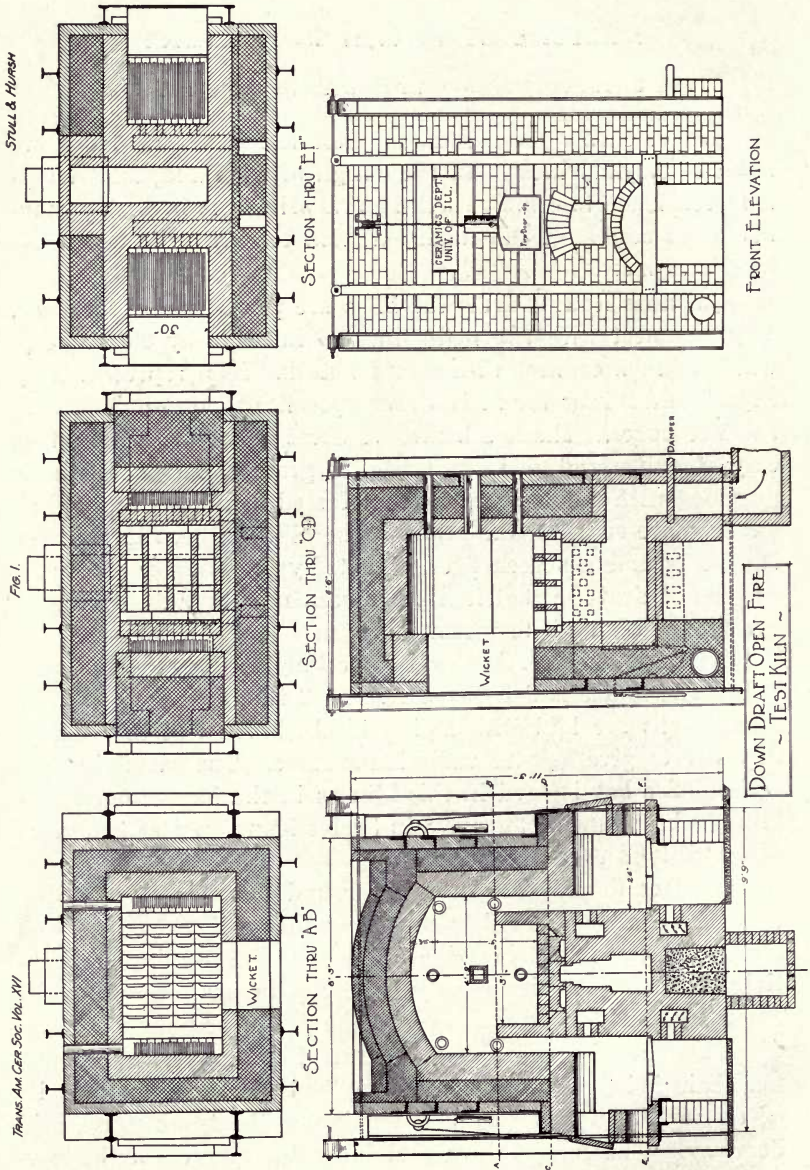


Fig. 1.

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year. Although it is capable of attaining very high temperatures, there has been no occasion to fire it above cone 8. This temperature has been attained with only two burners in use.

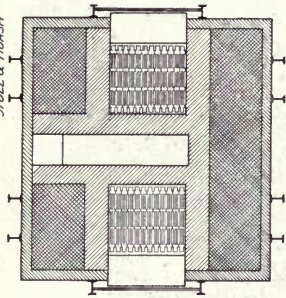
Figures 7 and 8: Open fire, down-draft kiln: The kiln is fired by gas and compressed air, both being preheated in coils



FIG. 2

of wrought iron pipe suspended in the out-going flue. The flue is provided with an opening just below the damper. Through this, air can be admitted in order to prevent over-heating of the coils. The kiln is fired by ten burners made from ordinary pipe fittings. Each burner is about the size of an ordinary Bunsen blast lamp. The kiln has been fired to cone 14 in six hours.

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SECTION EF

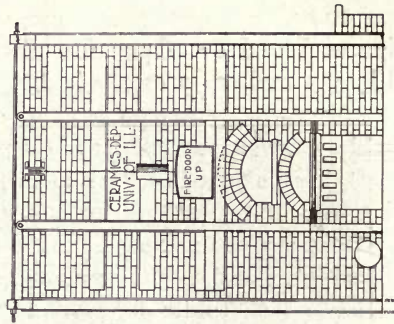
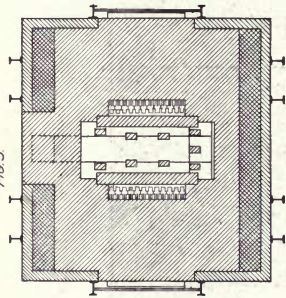
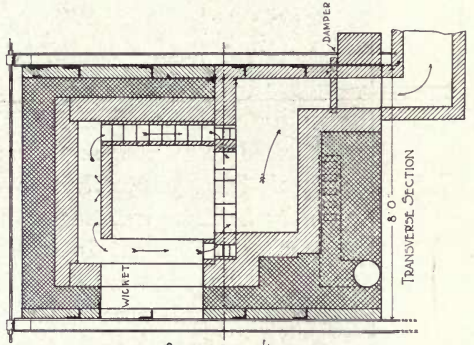


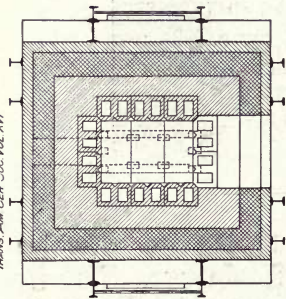
FIG 3



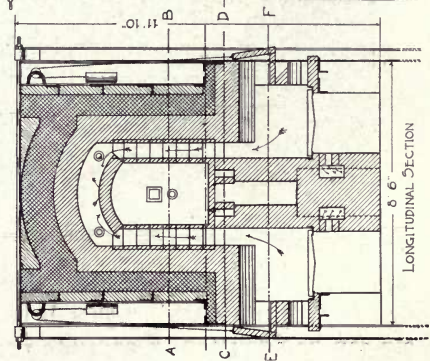
SECTION CD



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SECTION AB



The setting chamber is 12 in. by 22 in. by 9 in. to the spring, and 4 in. rise. The kiln is especially adapted to clay testing. Two plugs in the crown, one in the back and one in the wicket, are provided for drawing trials.

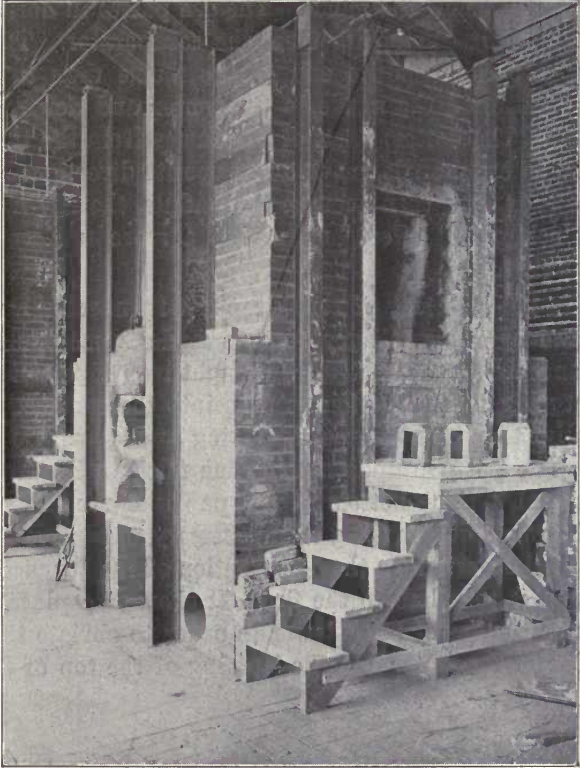


FIG. 4

Figure 9: Battery of three calcining kilns: Each unit is fired by fuel oil and compressed air. The combustion chamber at the top is cylindrical in form, the flame entering tangentially. Each unit is provided with two calcining chambers. The kilns are designed especially for burning small batches of Portland cement, and for calcining clays and dry colors. The material

to be calcined may be placed on the bottom plate of the chamber or in covered flat tile saggars.

Figure 10: Twin muffle kiln: The kiln was designed especially for firing enamels for metals and overglaze colors. Each muffle is heated by two gas burners, the air being preheated in the recuperator below the muffle. The gas passes in horizontally and meets the air coming up from the recuperator. The flame passes back to the opposite end of the muffle then turns and passes twice around the muffle to the center and down into the recuperator. The hottest parts of the flames from the two burners applied to each muffle, moving in opposite directions, encircle the muffle ends first, then encircle the middle, thereby neutralizing the "cold end" effect and giving a more uniform muffle temperature.

Figure 11: Battery of four drop-frit furnaces: Each furnace is fired by two small gas burners made from pipe fittings. The gas and air are preheated in wrought iron pipe coils placed in the outgoing flue. The flames pass into the combustion ring tangentially, then pass over a flash ring and down around the crucible. The frit pan underneath when filled with water forms a "water seal." The bottom of the pan is curved so that the frit can be raked out, making it unnecessary to remove the pan. The principal objection in the construction of the furnace is that the frit pan is too close to the fire. It should be placed about two to three courses of brick lower in order to obviate the rapid evaporation of the water and the burning of the top of the pan.

Ceramic Laboratories,
University of Illinois

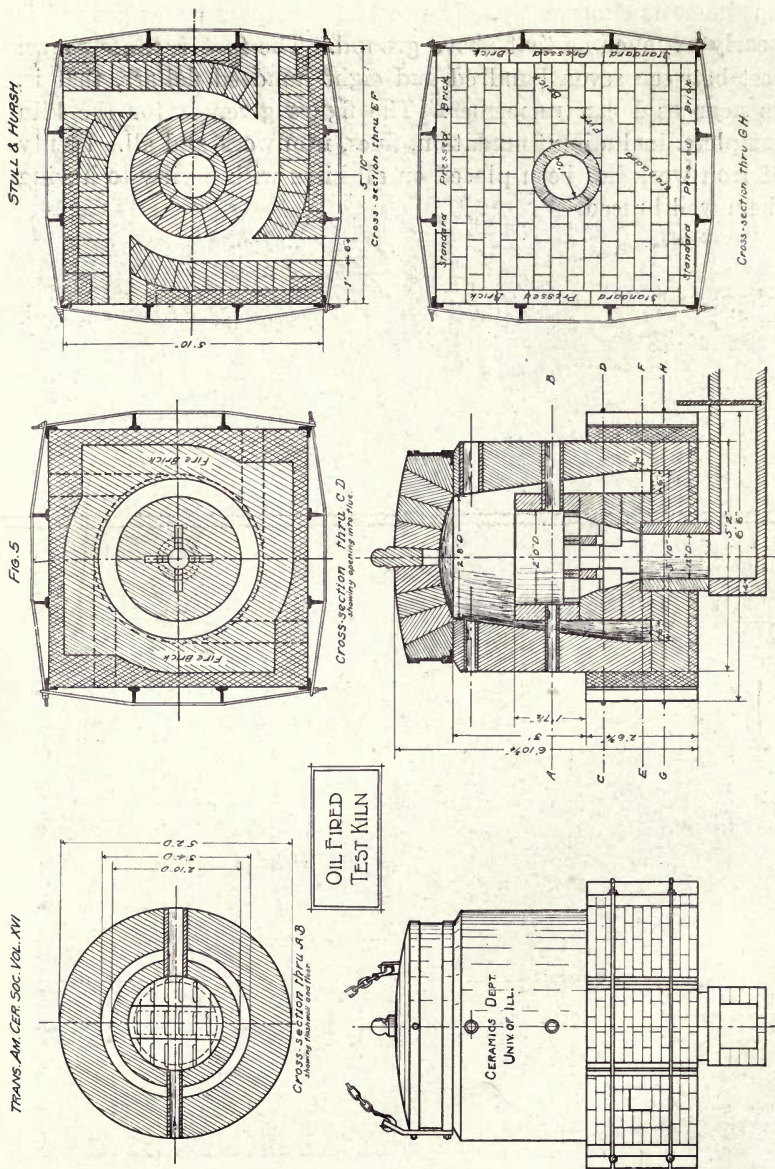
DISCUSSION

Mr. Blair: Will Professor Stull give us an idea of the cost of burning that first kiln?

Prof. Stull: Yes. I can give you an idea of the cost. Like Professor Bleininger, I did not want to scare you to death with the figures. A large fill was made on the present site of the new kiln house. In building the foundations for these kilns, it was necessary to go down so deep to get solid ground that it brought



up the costs enormously. The cost of that part below ground is nearly as much as that above ground. The first furnace shown cost between seven hundred and eight hundred dollars, that is, as near as I can remember. The figure given is for the kiln complete, including foundation, flues, iron work and all. Plenty of iron work has been placed on all kilns with a view to having them well braced.



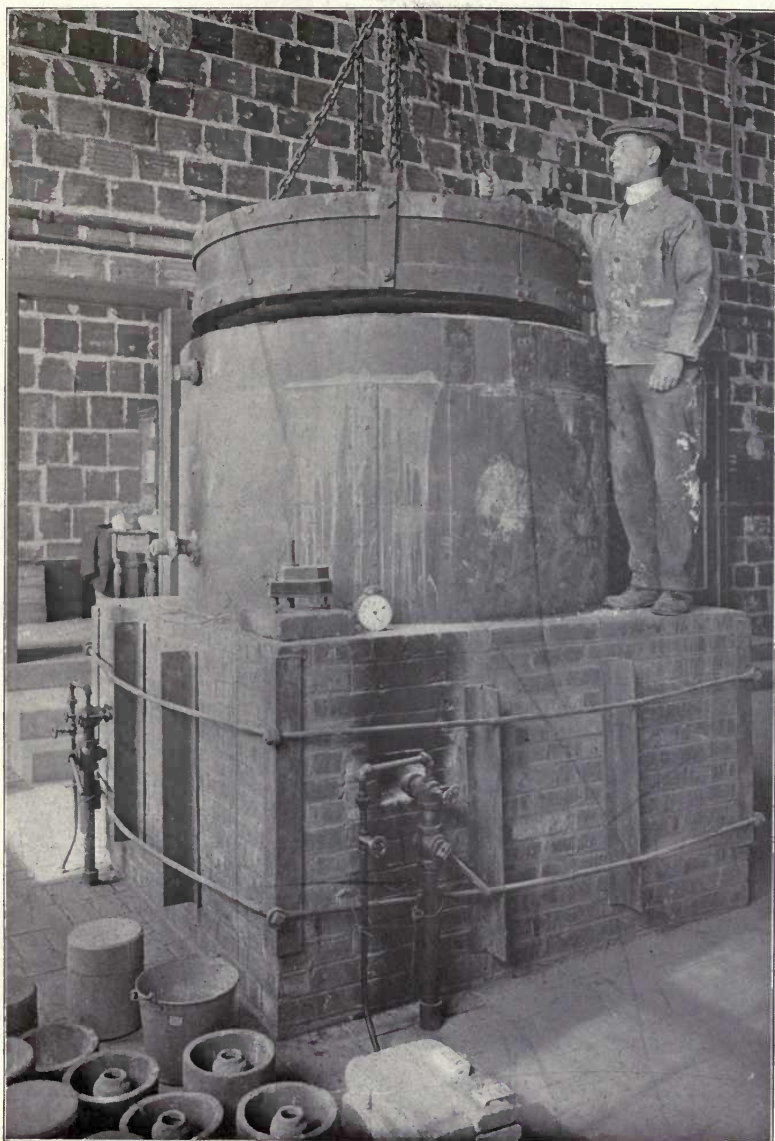
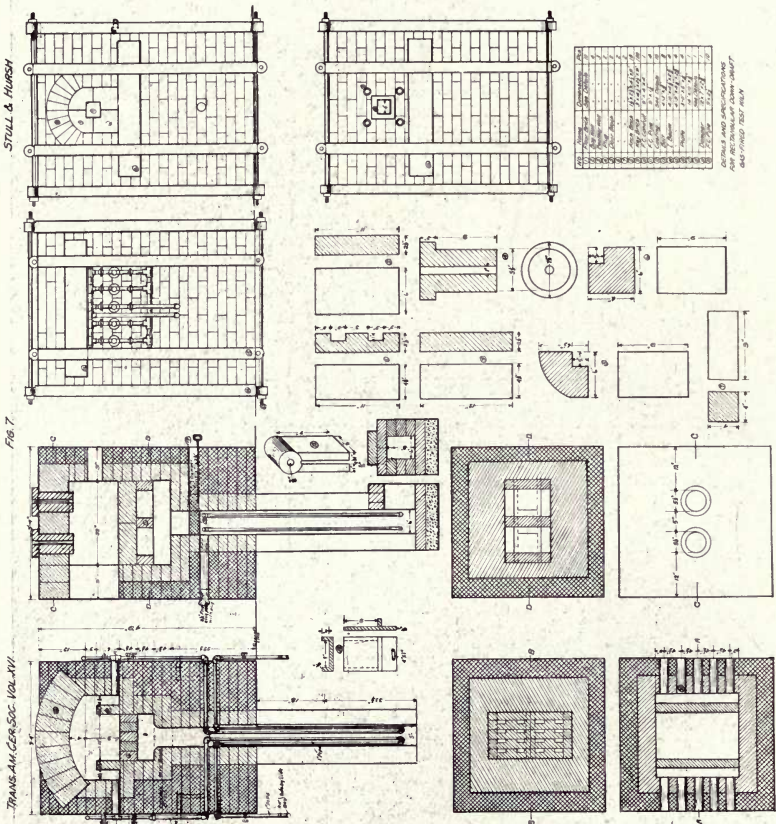


FIG. 6



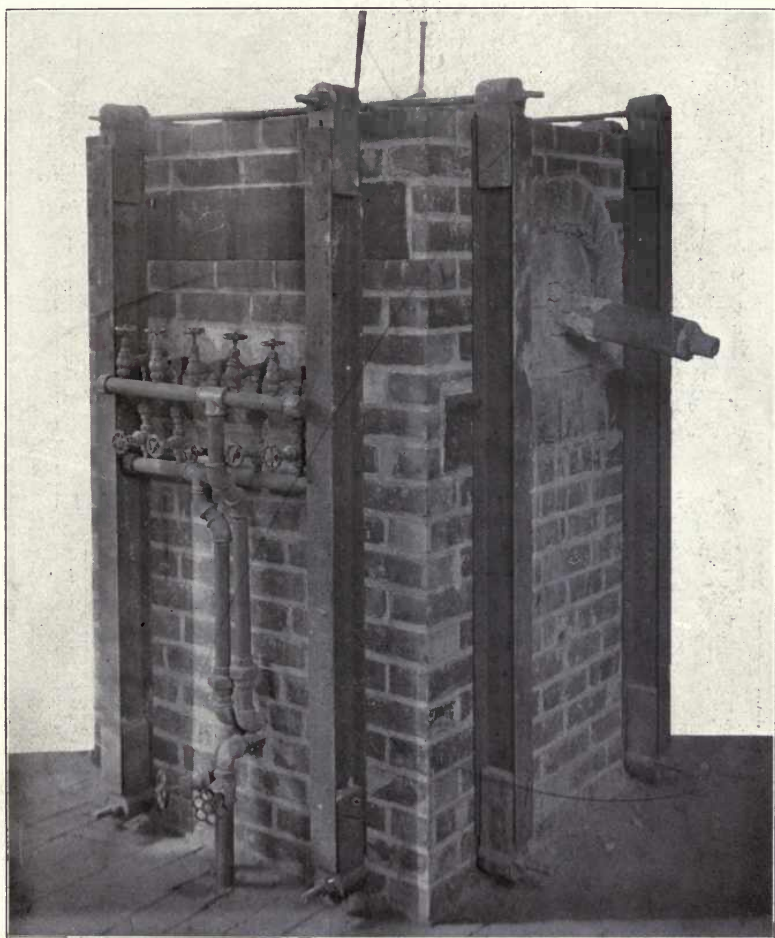
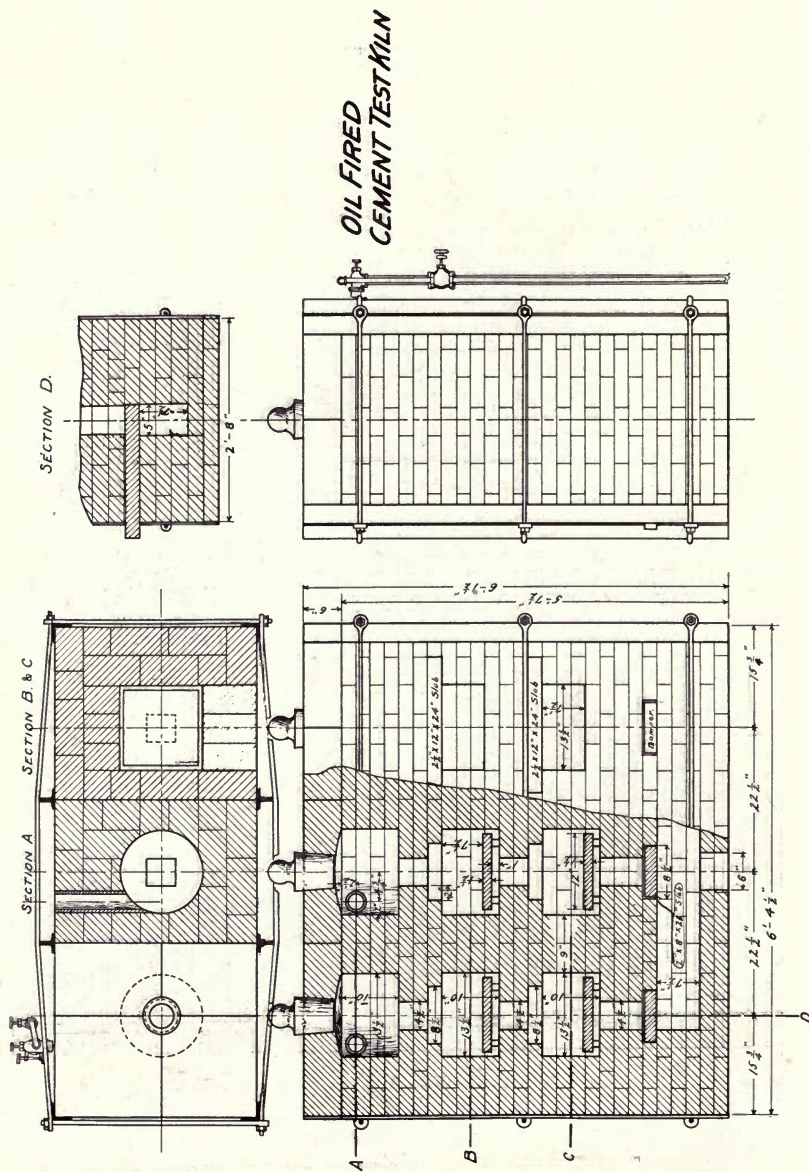


FIG. 8

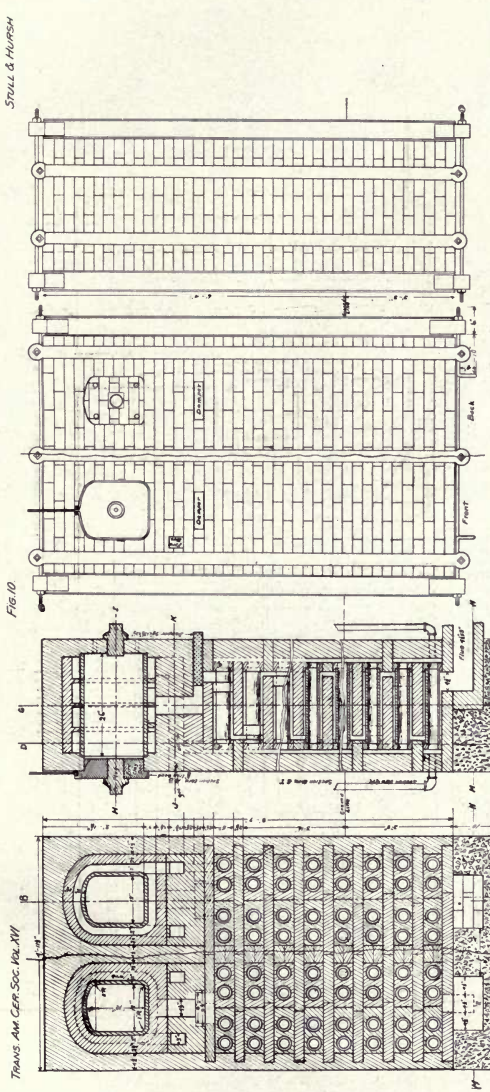
FIG. 9.

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FIG. 10

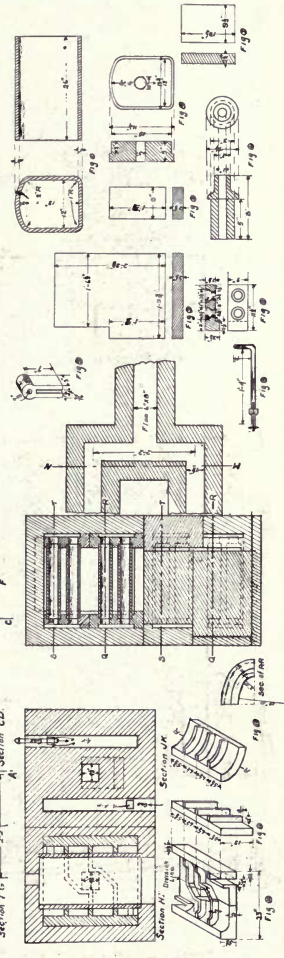


TRANS AM CER. SOC. PL. XIV

Fig. No.	Description
1	Gas Inlet
2	Pressure Gauge
3	Gas Valve
4	Gas Burner
5	Muffle Chamber
6	Refractory Lining
7	Support Base
8	Front Flange
9	Back Flange
10	Gas Inlet Pipe
11	Gas Valve Handle
12	Gas Burner Nozzle
13	Muffle Chamber Gasket
14	Refractory Brick
15	Support Base Bolt
16	Front Flange Bolt
17	Back Flange Bolt
18	Gas Inlet Nut
19	Gas Valve Nut
20	Gas Burner Nut
21	Muffle Chamber Nut
22	Refractory Brick Nut
23	Support Base Nut
24	Front Flange Nut
25	Back Flange Nut

Comp. Muffles & F. Pat.

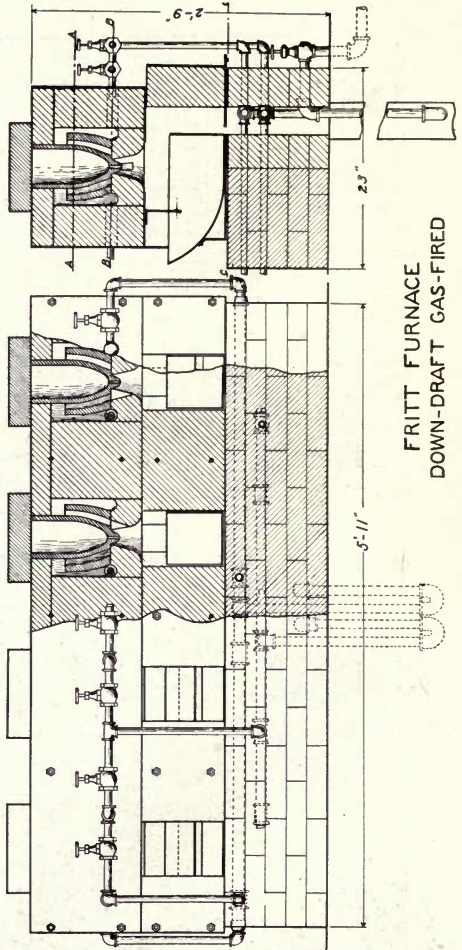
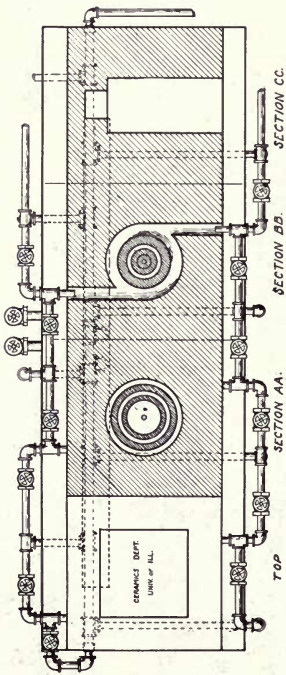
DETAILS
GAS-FIRED
MUFFLE KILN



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FIG. 11





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