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DESIGN OF A FOUNDRY FOR THE MICHIGAN AGRICULTURAL COLLEGE

Thesis for the Degree of B. S.

Walter D. Grossbeck

1892

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FOR THE

MICHIGAN AGRICULTURAL COLLEGE,

THESIS.

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August 9, 1892,

By W. D. Groesbeck.

DESIGN OF A FOUNDRY FOR

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MICHIGAN AGRICULTURAL COLLEGE.

In the description and plates here presented, it is not my hope to present a model foundry, even for the purposes for which it is designed, the instruction of students in moulding and casting and a laboratory for experiment in allied lines. The most that is sought is to give, with the means to be commanded and the site to be occupied, accommodations more or less good, for thirty students, and a few extra pieces of apparatus for convenience in handling work and experiments in mixtures of metals and variations in heats, as to econemy of fuel, grades of fuel, size and temperature of heats drawn.

To begin with, the situation of the pattern-shop, blacksmith-shop, and machine-shop, as well as that of the engine-room, make it almost imperative to place the foundry under the same roof. No detached building, however much better lighted, more commodius or pleasing in design, could be made as convenient in ease and rapidity of work; while the transmission of power for fan and blower, would become a perplexing problem, rope transmission or the setting of the blowers at a great distance from the cupola, being the only solutions.

As the foundry is designed to be placed in an extension of the wing at present containing the blacksmith-shop, it must be similar in design and dimensions. This, taking the required amount of space, will give a fairly good form to the floor, it being about twice as long as its width. With a uniform exterior design, hardly the desired amount of light is obtainable, particularly on dark days with the foundry wing shaded during the working hours by the main building.

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The probable amount of money available for the building and equipment will be another consideration limiting the plant to almost the barest necessities.

The building will be of brick, 12" walls, 30 ft. by 60 ft., inside dimensions; side walls 9 ft. high, windows at sides and in the ventilating skylight. The end wall at the east will have a 4 ft. door in the centre as an accommodation for blacksmith-shop extension. A three foot wide bench, 34" high, will extend along north and south sides in such portions as have best light from the side windows, and a brass furnace with two hearths will occupy the west end. The cupola will be situated midway of the south side, with core oven to the east of it, and coke, coal and iron bins under the same roof. A three ton traversing crane will be arranged to cover the entire floor space.

In the cupola room, will be placed an hydraulic hoist as well as steps to the charging platform, and coal, coke and pig will be made as convenient for handling as possible. Plan andsection will show the construction of the wing, while the elevations will give an idea of its general appearance. The plan shows better than can a description, the location and arrangement of the moulding benches loam pit and floor.

The crane will be of two 12", 20#, steel channels, without any truss supports. Brick ledges on the side walls will support an ordinary light R.R.T-rail track, placed as close as possible to the side walls. The crane will be arranged for hand power and is designed as much for instruction and experience in such machines as for actual necessity. The same may be said of the hoist.

The cupola will be a common, straight one, 24" in inside diameter, with 6" lining and 3/16" boiler iron shell. This style is chosen on account of its lower cost and because repeated tests have not shown sufficient advantage in special or patented designs to warrant their adoption. The whole rests on four 4" cast iron columns, supporting a cast iron bottom plate 44" square. The tuyeres are eight in number, arranged in two rows; the main ones 4" in diameter and 90 degrees apart, while the upper row are but 2" in diameter and may be opened or closed at pleasure for experimental purposes. The rows are 12" apart and the upper tuyeres will be set 45 degrees around from the lower. They will be fed from a 4"x16" jacket or tuyere belt, air being supplied through a 9" pipe. The charging door, 14" x 16", will be set 9 ft. above the bottom plate, and the lining from this point to the top will be but 4" thick. The whole cupola will be so set that only the tap hole will show in the moulding room.

Blast will be furnished by either of two styles of blowers, of about equal capacity and either large enough to give the necessary blast alone. The Root blower andSturtevant fan are chosen as good representatives of the different types, the one positive and slow speed, the other of the high speed, fan type. Either the Root blower No.2, or the Sturtevant fan No4, if up to guarantee, will furnish an excess of air for the weight of metal to be melted per hour, the former running at 275 r.p.m. and the latter at 3100.

In designing the hoist, the available water pressure per square inch of lifting area is found to average, from tank, only about 30#. With a 7" ram, this will give a net lift of about 700#. The hoisting cylinder will be of 10" wrought iron water pipe, with

cast iron cap recessed for leather U packing collar. The piston, or ram, is a similar piece of 7" pipe turned and finished outside, and closed at the bottom with a cast, screw cap, water tight, the cap at the same time acting as a stop in case of derangement of the valve. The will be the usual three way hoist valve with automatic stops at top and bottom. For details see section drawing of hoist.

The core oven will be 6 ft. by 12 ft. and 9 ft. high, with car and track of 3 ft. guage. The hearth for heating the oven is in the cupola room and the fuel to be used is coke or hard coal. Light iron doors will close the oven on the moulding-room end. The outer wall will furnish two sides of the oven and an 8" wall the other two. Top will be covered with flat arches supported by light 4" I beams, (channels at ends), set 3 ft. apart and running across the oven.

The brass furnace will have two hearths, each 18" square and both connected to one chimney. The firing pit will be 2 1/2 ft. by 5 ft. and will be brought only to the general floor level, being covered when the furnaces are not in use. The grates will be arranged to drop at the front end for ease in cleaning after the fire has burned out.

In a wooden extension of the cupola room, will be provided bins for coke, coal, moulding sand and pig iron, with end door for filling and barrows for handling. Scales on trucks can doubtless be most conveniently placed in the passage when charging the cupola and stored on or beneath the charging platform when not in use.

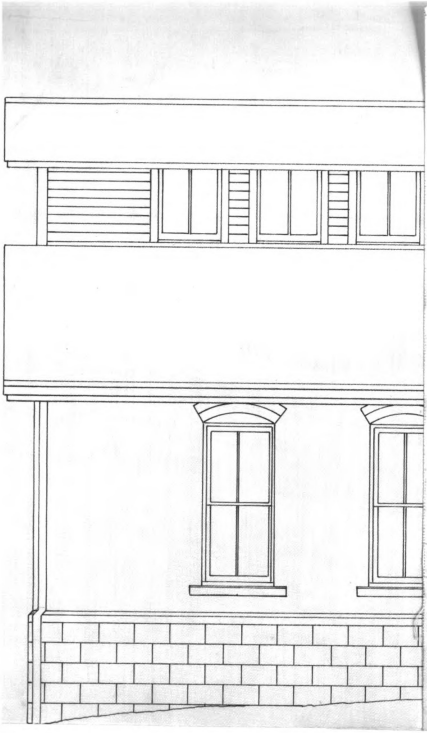
The drawings show: Front and end elevations, general plan, section of moulding room, vertical section of cupola and section of hydraulic hoist.

Specifications, further than those given in description and drawings, are not presented; neither is an estimate of cost. All drawings are arranged and numbered to correspond with the above enumeration.

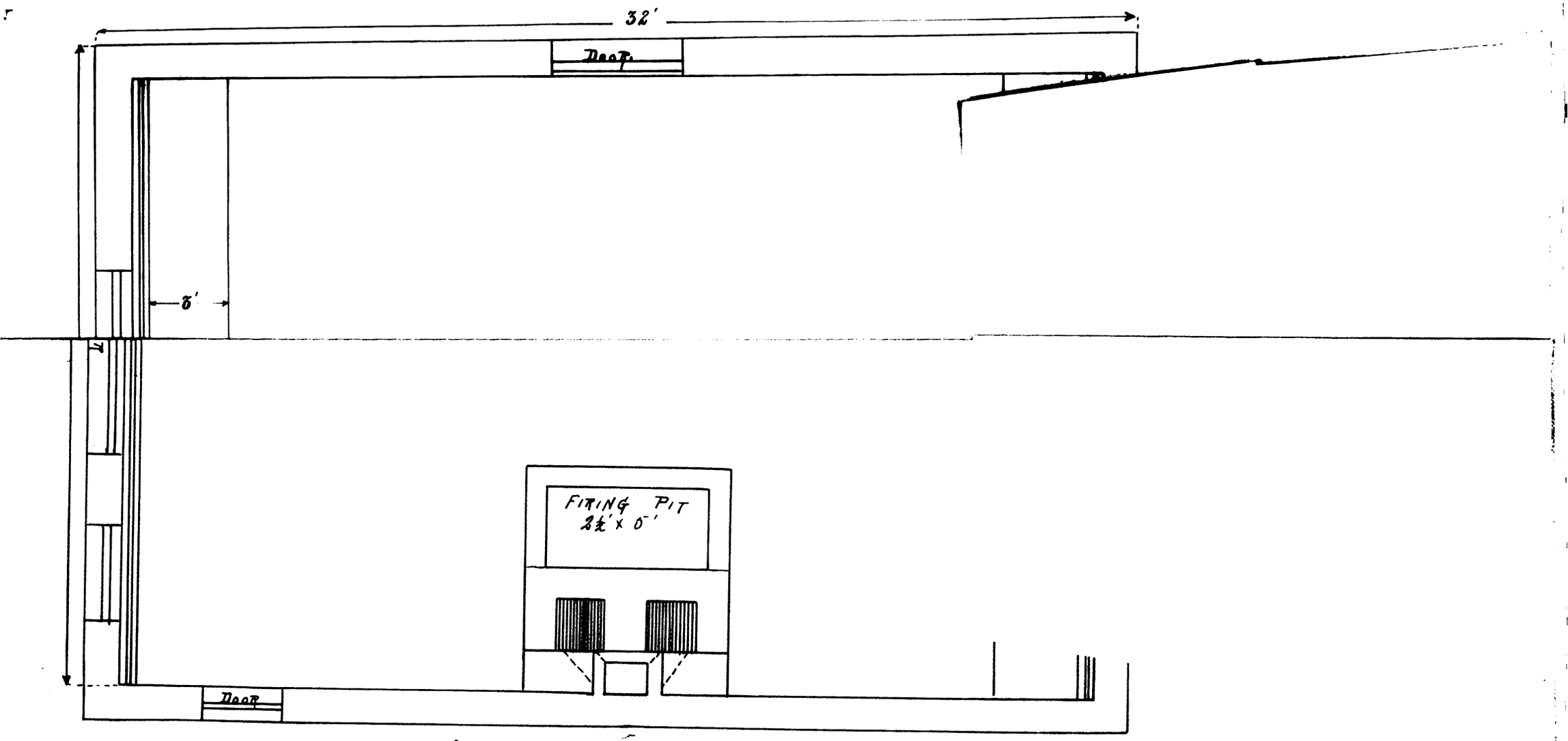
Respectfully submitted,

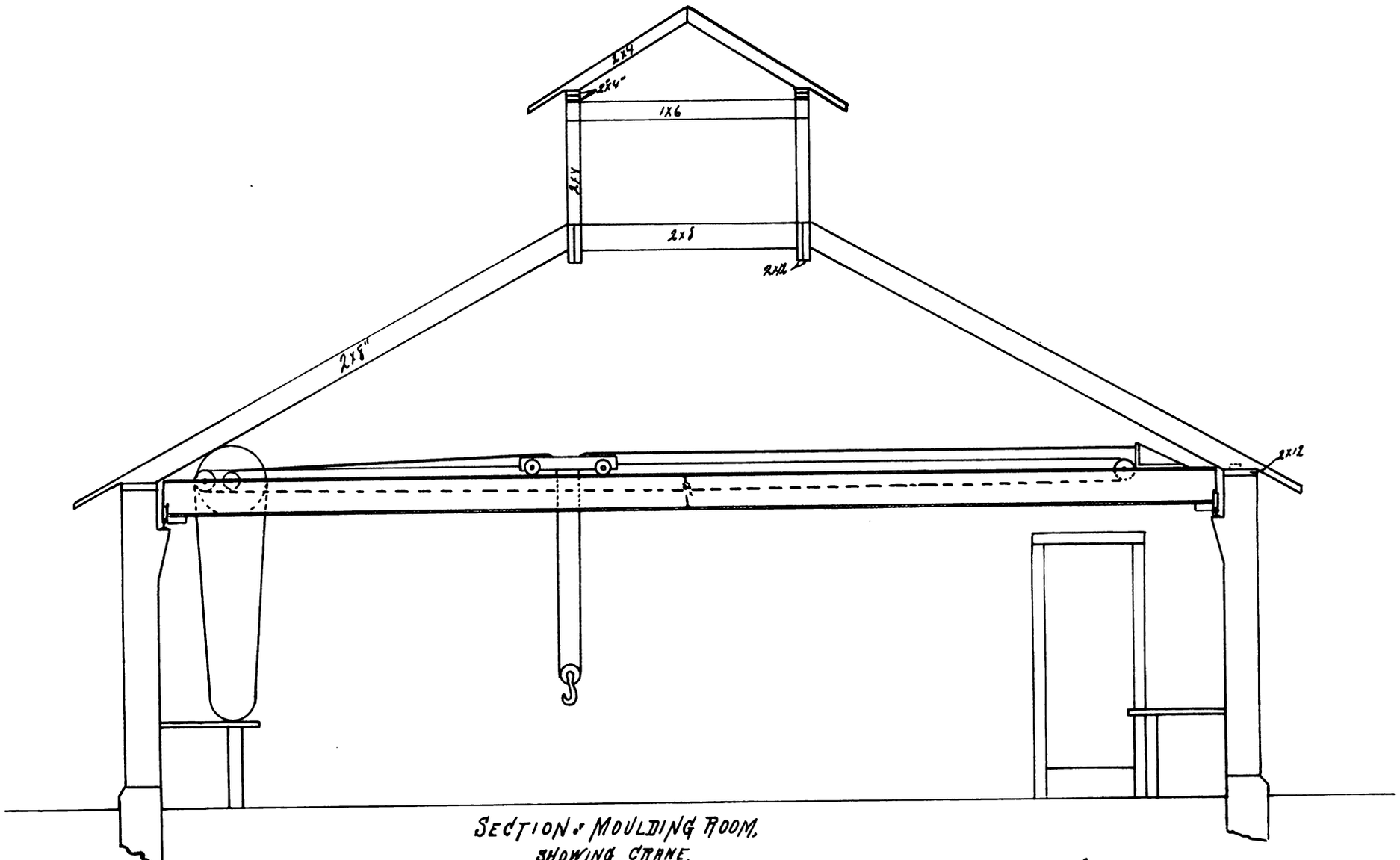
Walter D. Groesbeck,

August 9, 1892.



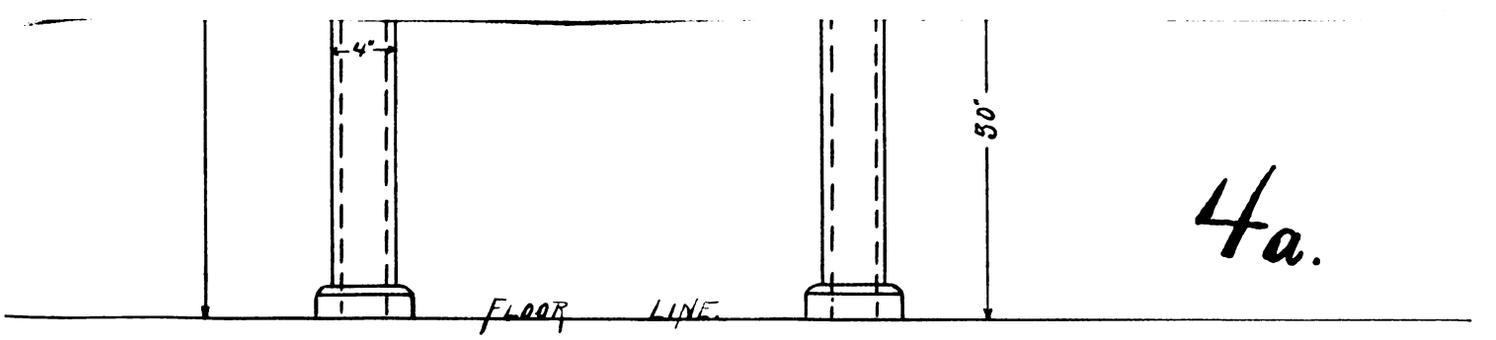
2.


32'
DOOR
8'
FIRING PIT
DOOR



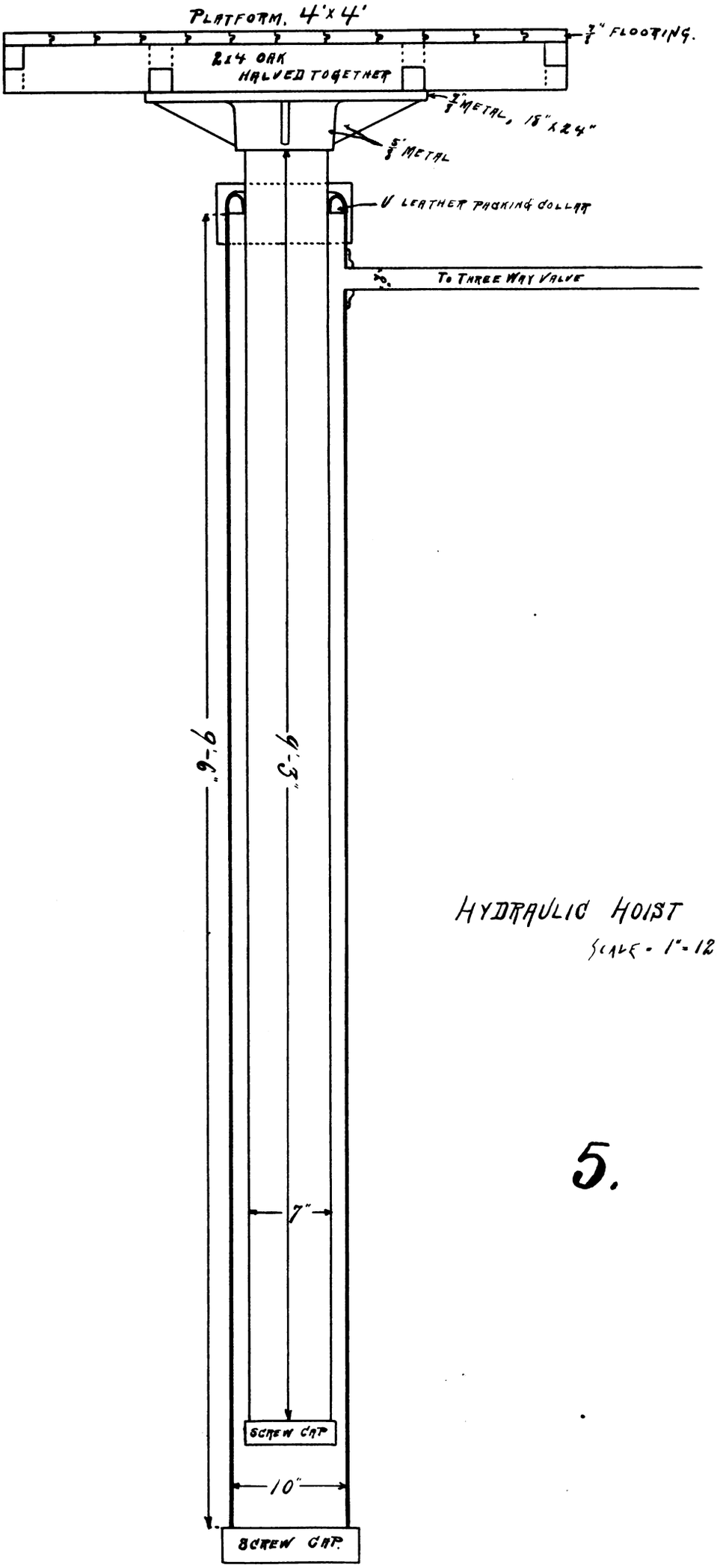
SECTION of MOULDING ROOM.
SHOWING CRANE.
SCALE - ¼" - 1 FT.

4.



4a.

VERTICAL SECTION OF CUPOLA.
SCALE - 1" = 12"



HYDRAULIC HOIST

SCALE - 1" = 12".

5.

ROOM USE ONLY