

COLOMBIA.

Mr. F. H. Wheeler of the British Legation, Bogota says:— I regret that the information I am able to give you upon the subject (of earthquakes) is almost entirely of a negative nature. (1) There are no Government regulations with regard to the method of building houses in districts subject to earthquakes. (2) The houses in such districts are now usually built of thick *adobe* bricks, and of one story, but the old Spanish builders used to try and defy earthquakes by building very strongly in stone, but with indifferent success. (3) There is no Seismological Society in Colombia, and no record of earthquakes has ever been kept,—officially at any rate. Scientific knowledge of any kind is rare in Colombia, and what little exists is mostly centered in Bogotá, which is one of the parts of the country least subject to earthquakes. We have a scarcely perceptible shock here, about two or three times a year, on the average. (4) The only publication of any sort on the subject of earthquakes which I have been able to find here, is a short account of an earthquake which occurred in Colombia in 1868, written by a Mr. Gonzalez, who appears to have been the only the person who ever interested himself in the subject. I send you a *précis* of this article. I cannot find out what sort of seismometer he used in his observations, but evidently some some sort of pendulum, with free horizontal movement in all directions.

At the time of the great earthquake which destroyed Cúcuta in 1875, on May 18th, at 11 a.m., some rough observations were made by a gentleman here of considerable scientific knowledge, but who had never especially studied Seismology.

Several slight shocks had been felt in Bogotá a day or two before, and he had arranged a simple pendulum, hung by a wire spiral from the ceiling of a room, over a tray of fine sand. At the moment of the Cúcuta earthquake the pendulum traced a small but very excentric ellipse on the sand. He kept no drawing of it, but from his description, I suppose that

$$\frac{x^2}{(1 \text{ in.})^2} + \frac{y^2}{(\frac{1}{8} \text{ in.})^2} = 1$$

would about represent it—Cúcuta is about 400 miles N.N.E. of Bogotá. The shock was distinctly felt by everyone here.

The Southern part of the State of Cauca, especially the district near Popayán, and the North of Santander, bordering on Venezuela, are the parts of Colombia most subject to earthquakes, and interesting observations might be procured from them. But no one possesses the necessary instruments, or would spend much money in obtaining them, or much time in making the observations.

ECUADOR.

Mr. C. W. Lawrence writing from Quito says:—There are no government regulations as to the building of houses in districts subject to earthquakes nor any rules followed by builders. Very few houses have more than one upper storey. In a few large ones there is one room built with a view to earthquakes, *i.e.*, that the walls instead of being of sun-dried bricks are built with beams in this wise  the interstices being filled up with one line of adobes placed upright, the idea being that even should the walls come down there would be much less chance of being crushed than with the ordinary walls which are three feet thick. As, however, heavy timber is used in the roofs which are tiled, the thinner walls could not be much of a safeguard.

The soil in this part of Ecuador is clay and Quito has never been visited with earthquakes sufficiently strong to upset the houses, as has happened in Riobamba, Ibarra, etc. This immunity is attributed to the hardness of the soil and to the fact

that there are many deep and wide ravines in and outside the town, which is built on the slopes of the Volcano Pichinstor. In the coast provinces the houses are built mainly of wood, but the serious earthquakes seem to be confined to the high table land between the ten Cordilleras. Riobamba, Ibarra, etc., have been rebuilt as before with adobe walls, but hardly any houses have an upper story. It is now nearly five years since I came to Quito, and there have been several tremors, but I have felt quite as strong in Tokio.

VENEZUELA.

His Excellency H. L. Boulton, writing to Mr. Clarke-Thornhill from Caraccas, says that there are no Government regulations with reference to earthquakes. Builders as a rule follow no special rules, but the buildings are generally of one storey only, and no regular observations are made respecting Earthquakes.

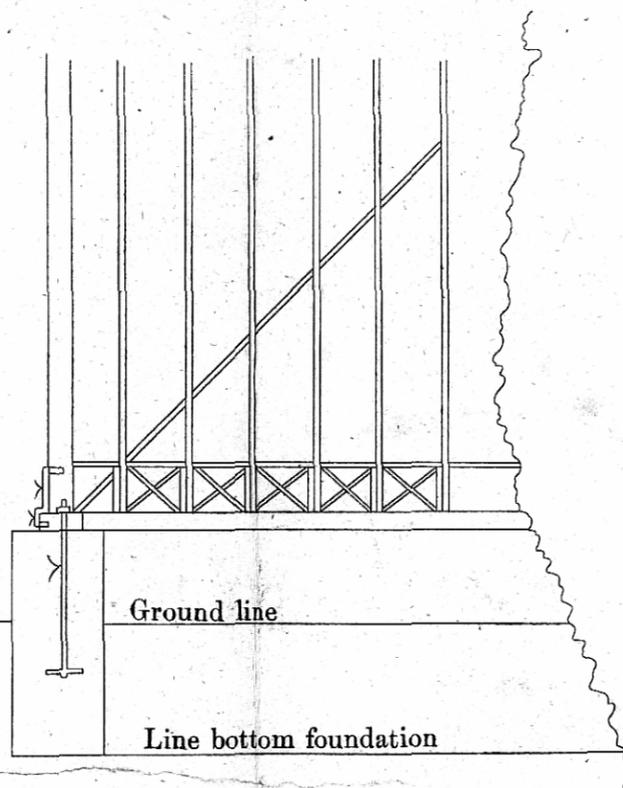
MEXICO.

Sir Spencer St. John, writing to Mr. Clarke-Thornhill from Mexico, encloses a note from Mr. De Solo saying that there are no regulations enforced by Government nor are there any special rules of construction. However, the old Spaniards built their houses in a very solid manner as in Bolivia, or of very light materials which can yield as in Lima. The old houses in Mexico are solid, but as the city is built on a basin of sand the shocks are not strong.

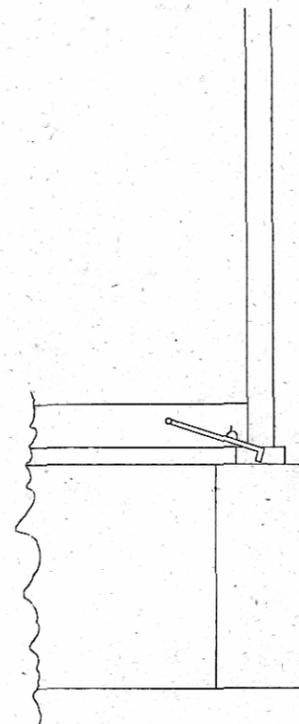
GUATEMALA.

The accompanying drawing of an earthquake-proof house by Messrs. Clark and Co., contractors was obtained through the kindness of Mr. John Moffat, H.M. Consul at San Salvador, who tells us that he has been informed that the government there have not issued nor do they enforce any regulations with regard to buildings. From the writings of Mr. W. A. Goodyear, State Geologist, and F. de Montessus de Ballore, Capitan de Artilleria, it appears that earthquakes are very frequent in San Salvador.

iron dog $\frac{3}{4} \times 18$.
 wall Plate 4×12 .
 iron anchor $\frac{3}{4} \times 70$.

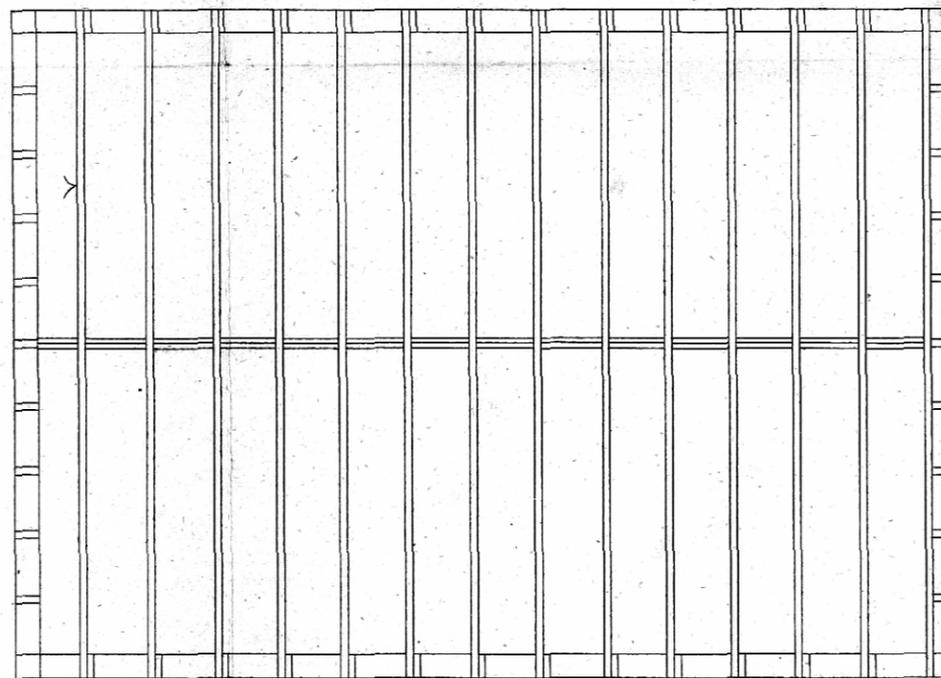


iron dog $\frac{3}{4} \times 24$.
 wall Plate 4×12 .
 stone Foundation 24×50 .



SECTIONS

Slodding $3 \times 6 - 3 \times 8$.
 18 between Centres.
 Floor timbers 3×12
 18 between Centres.
 Ventilators 10×14 inserted
 in the walls above the
 ground line for ventilation
 under all openings.
 All the interior walls
 are treated in the
 same manner as
 outside walls.



The wall plates are
 secured to the foundation
 by iron bolt anchors every
 4 feet and floor timbers
 and slodding are spiked
 together and secured
 to wall plates with
 iron dogs every 3 feet.
 The floor timbers are 3×12 .
 Studding 3×6 & 3×8
 and all walls are filled
 in with brick concrete and
 plastered both sides.
 The upper story is constructed
 in the same manner.
 All walls being braced at an
 angle of 45 from sill to plate
 with 3×6 bracing

Ground Plan of a room 12×20 with Sections. $\frac{1}{4}$ inch scale
 and explanations showing, construction of a Residence erected for Doctor Zaddivio in Salvador
 Secure against earthquakes.
 by C. & M. Contractors.

Fig. 1

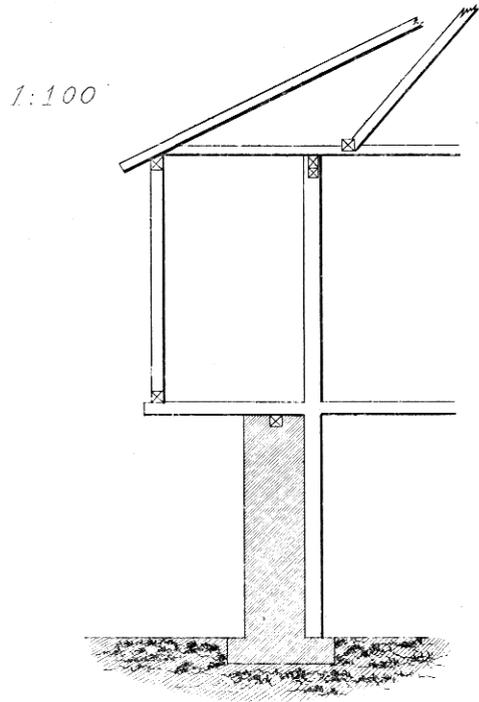


Fig. 3

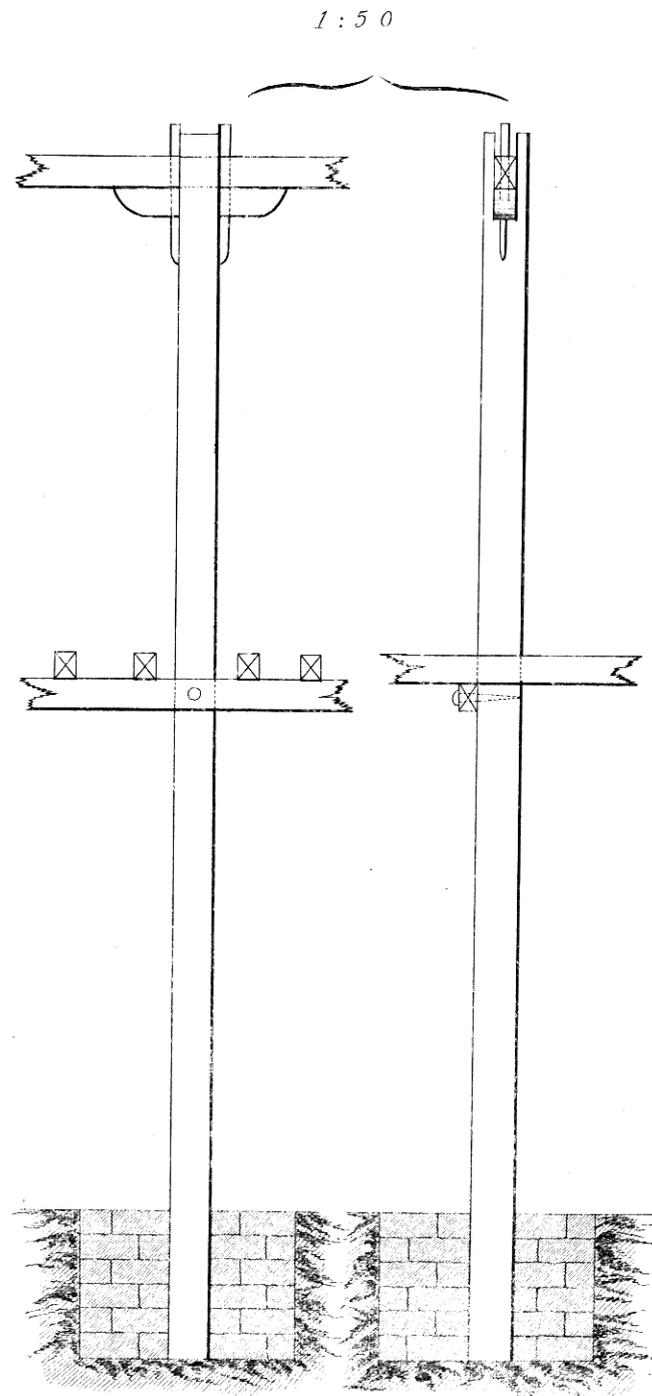


Fig. 4

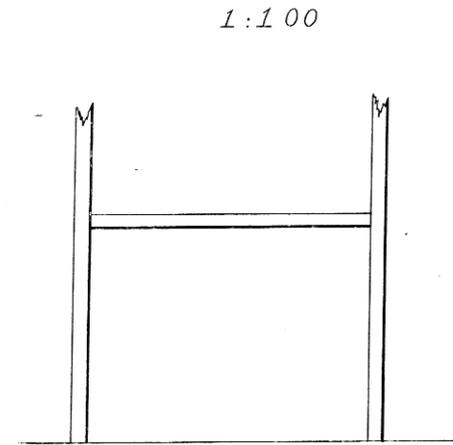


Fig. 2

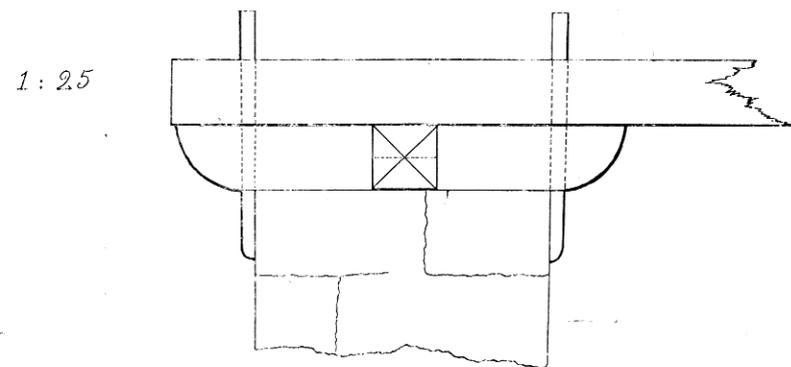


Fig. 5

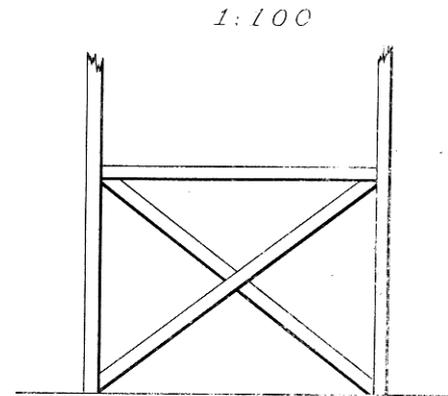


Fig. 6

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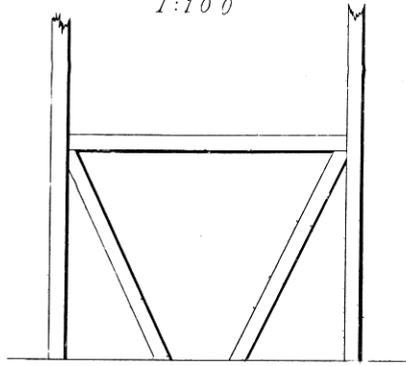


Fig. 7

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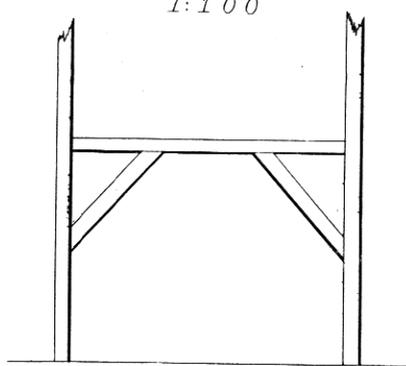


Fig. 8

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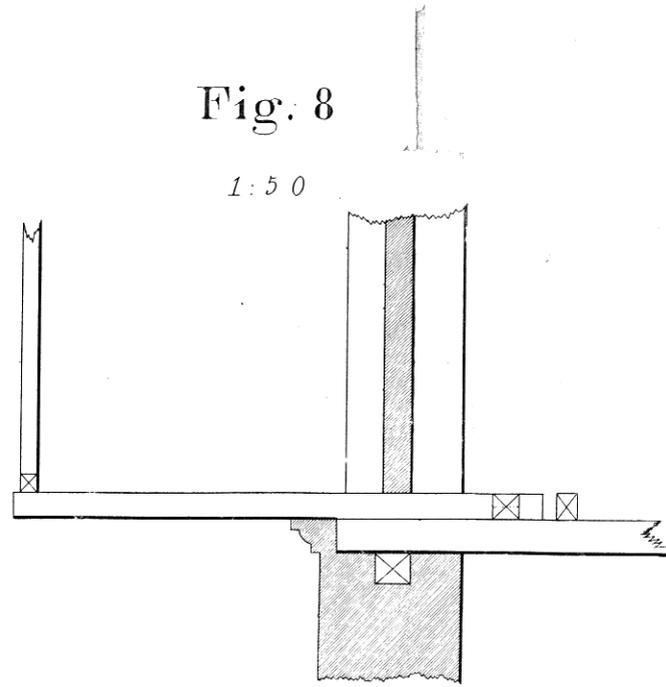


Fig. 9

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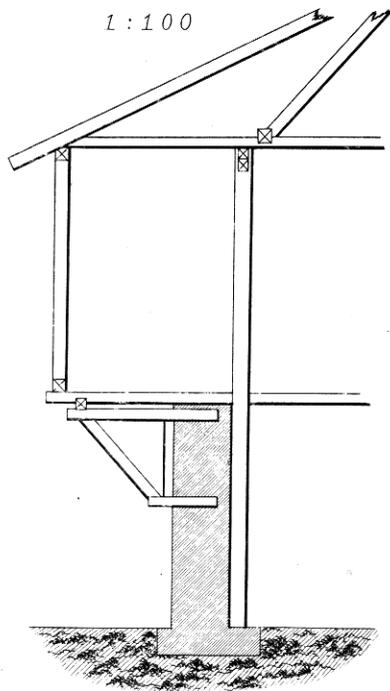


Fig. 10

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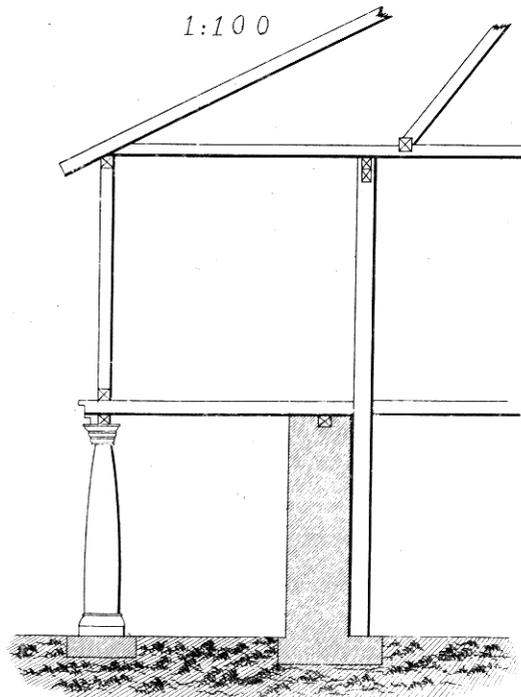


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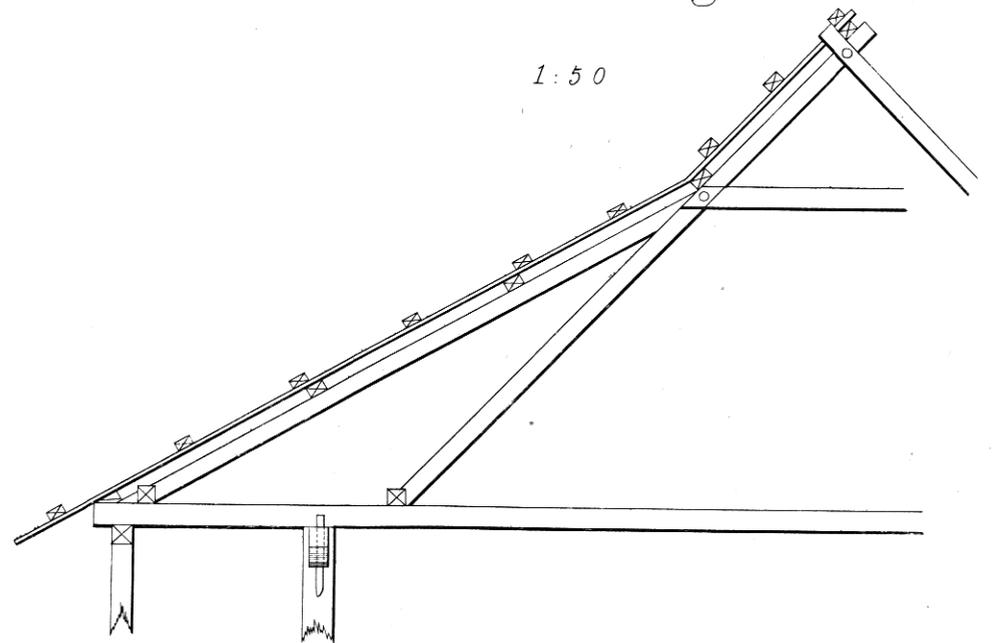


Fig.12

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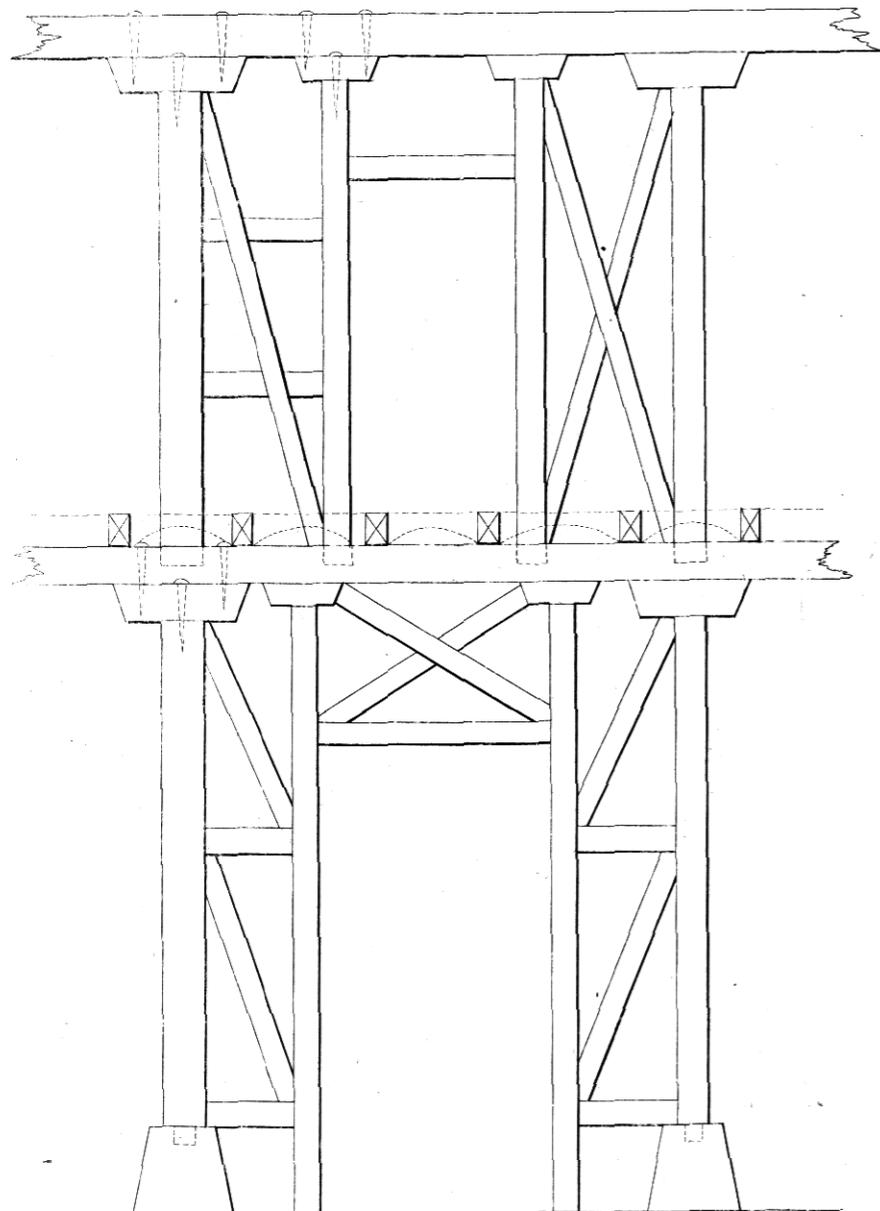


Fig.13

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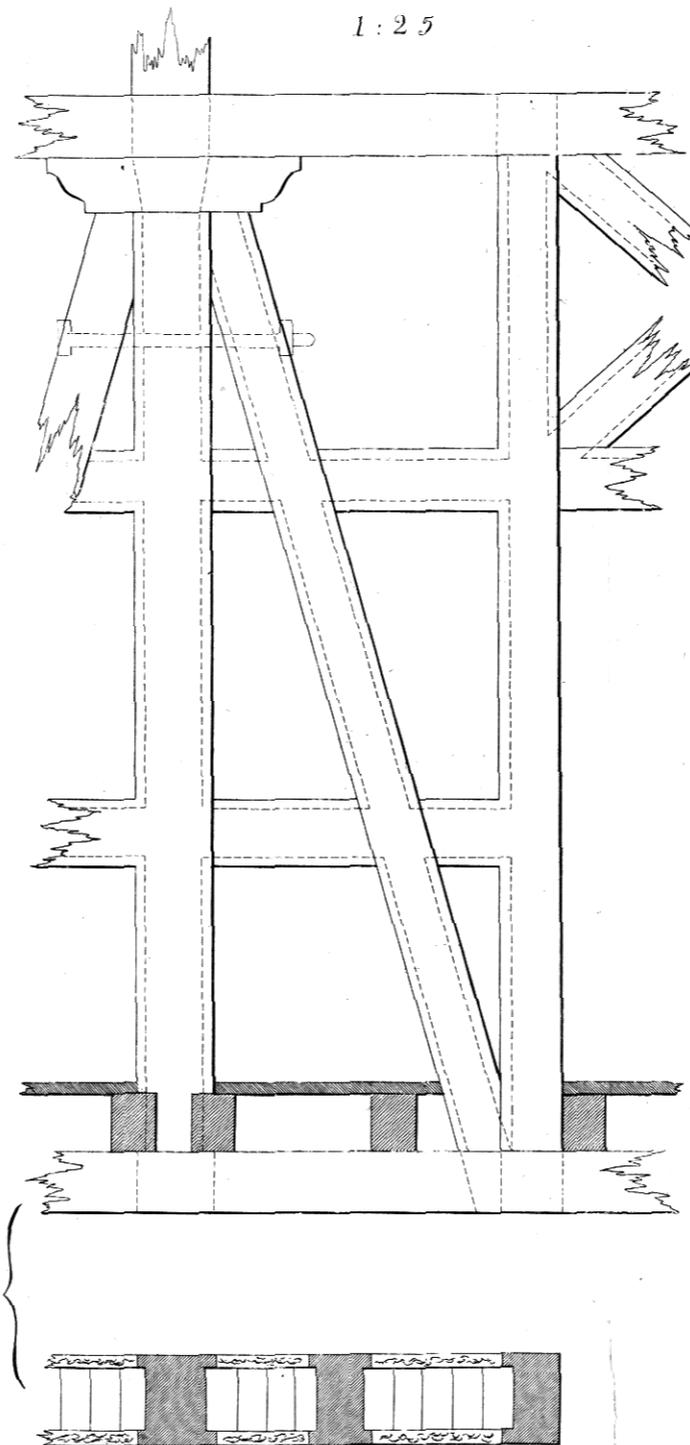


Fig. 14

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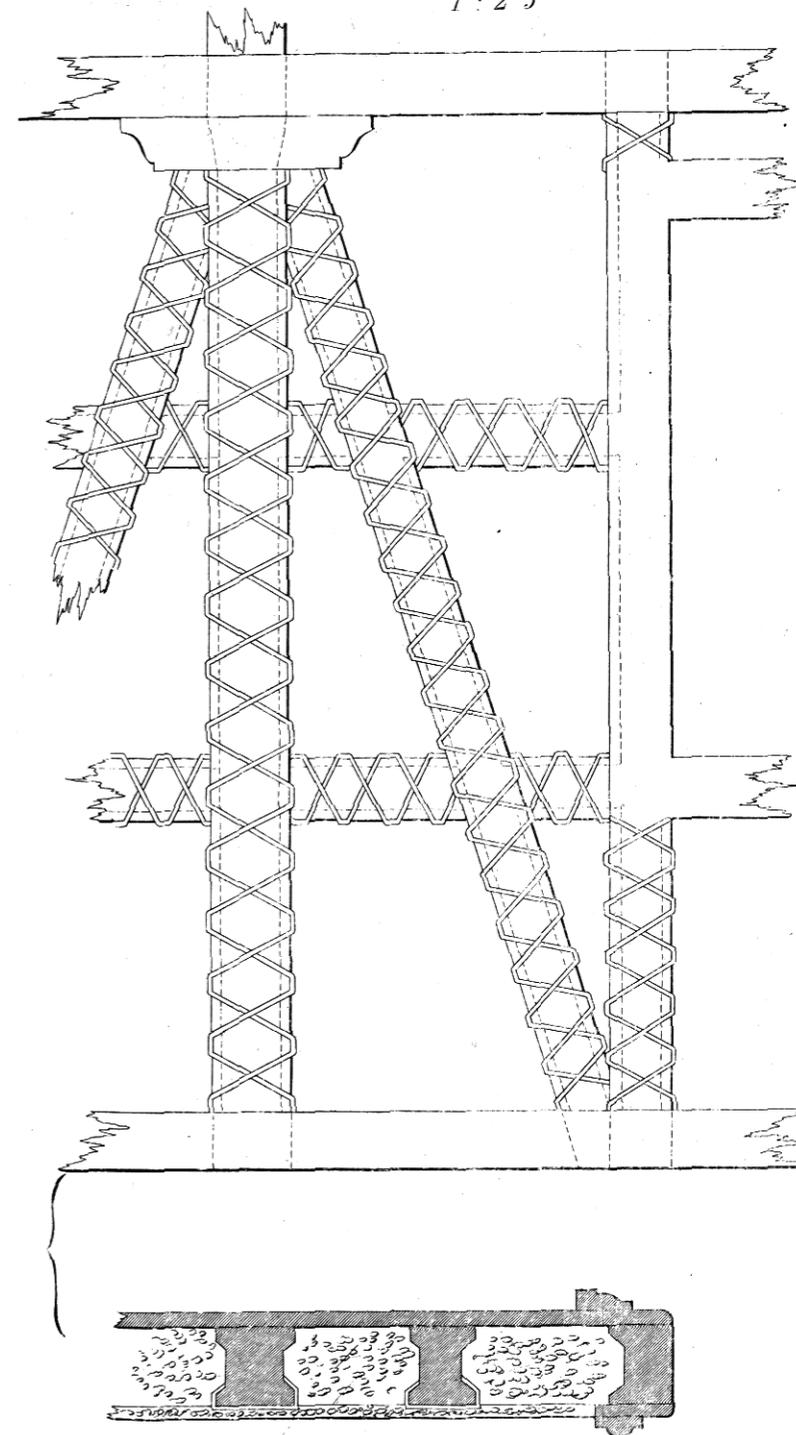


Fig 15

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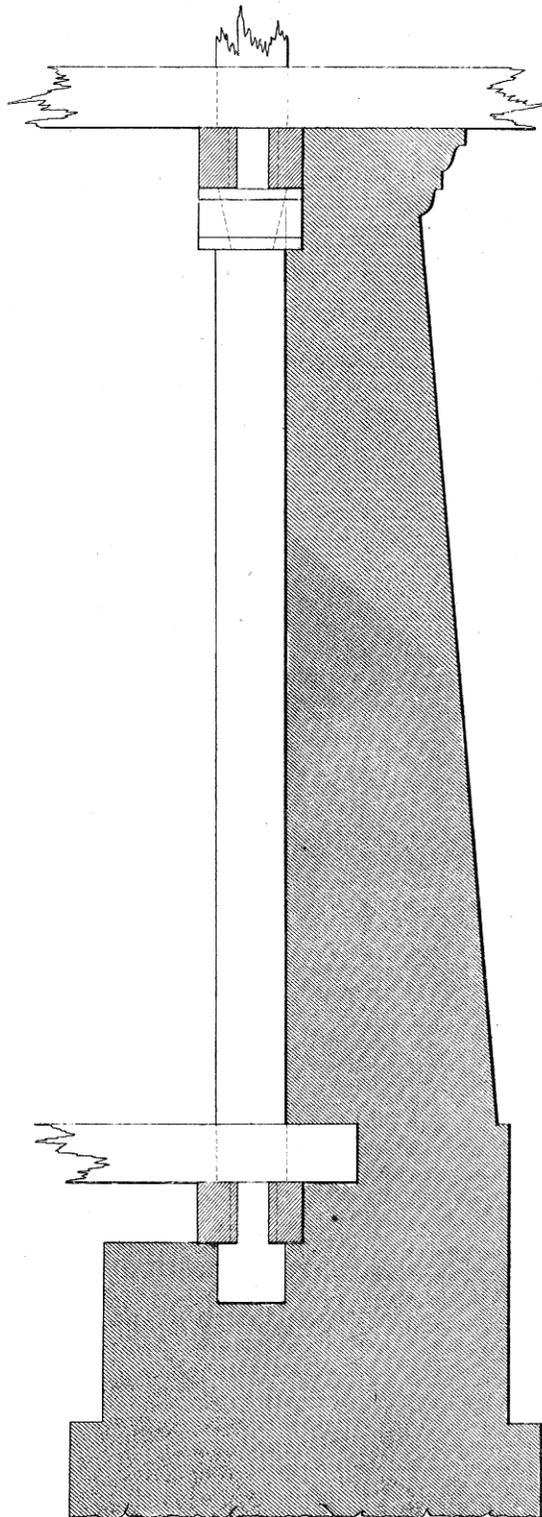


Fig.16

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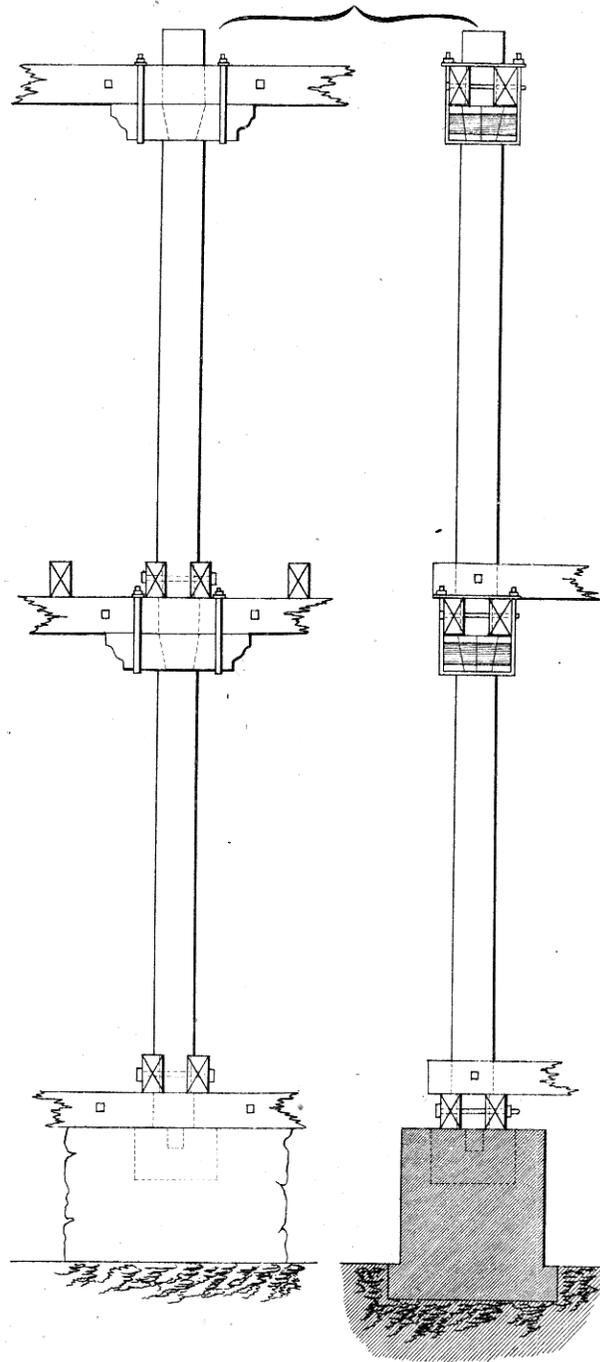


Fig.17

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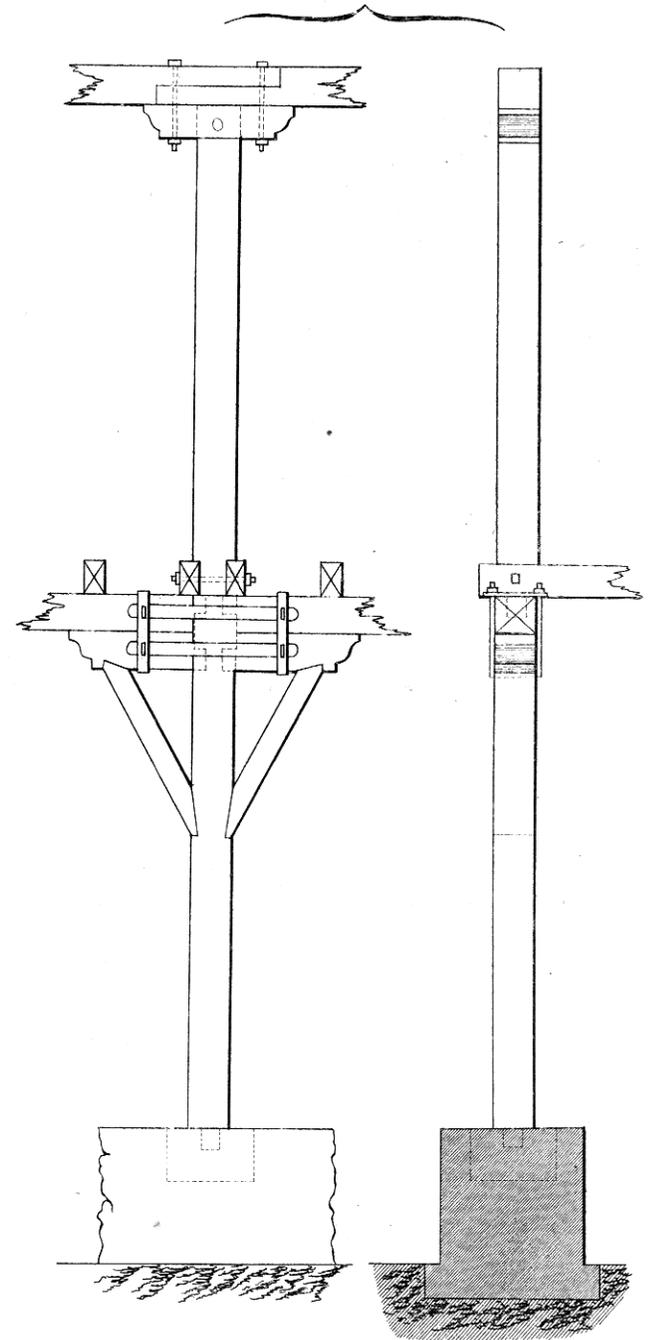


Fig. 18

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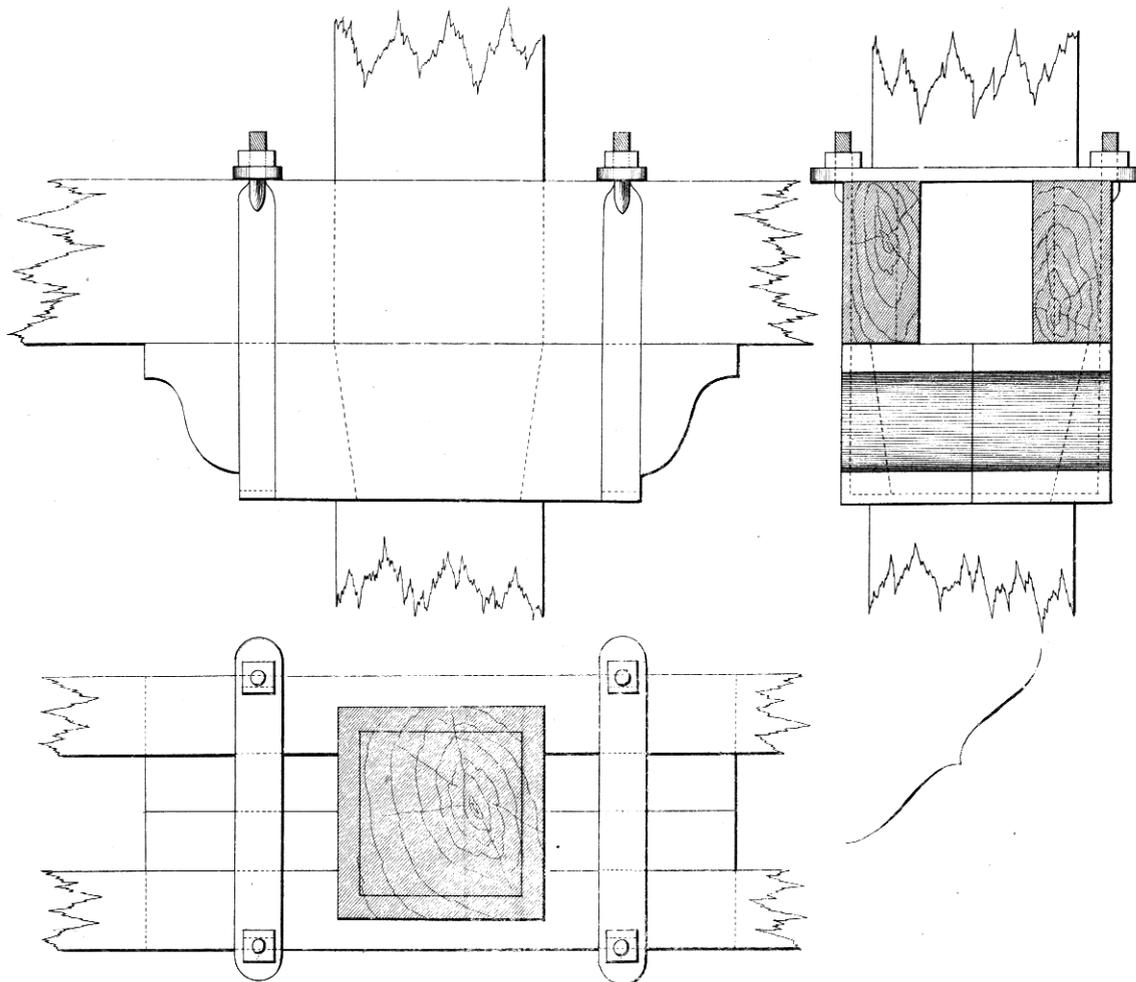


Fig. 19

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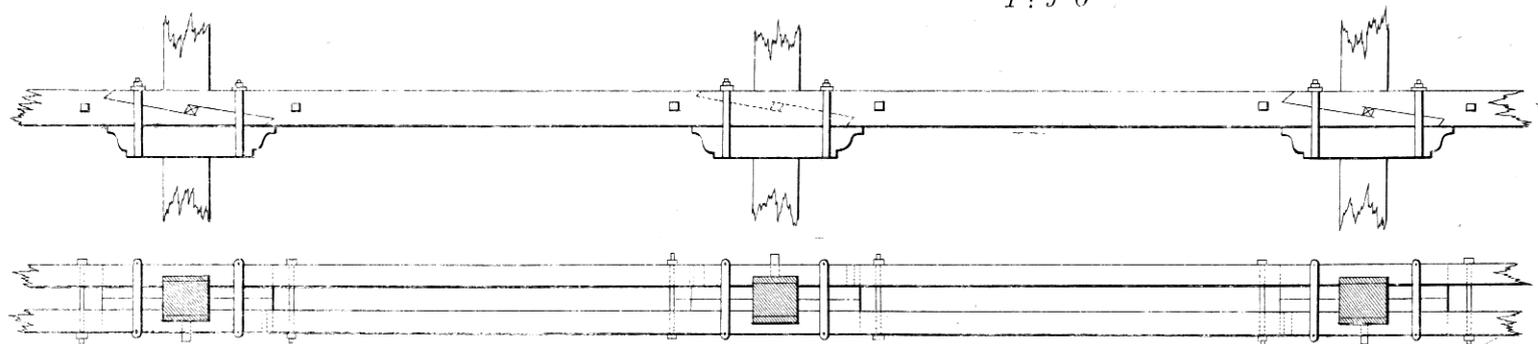


Fig. 20

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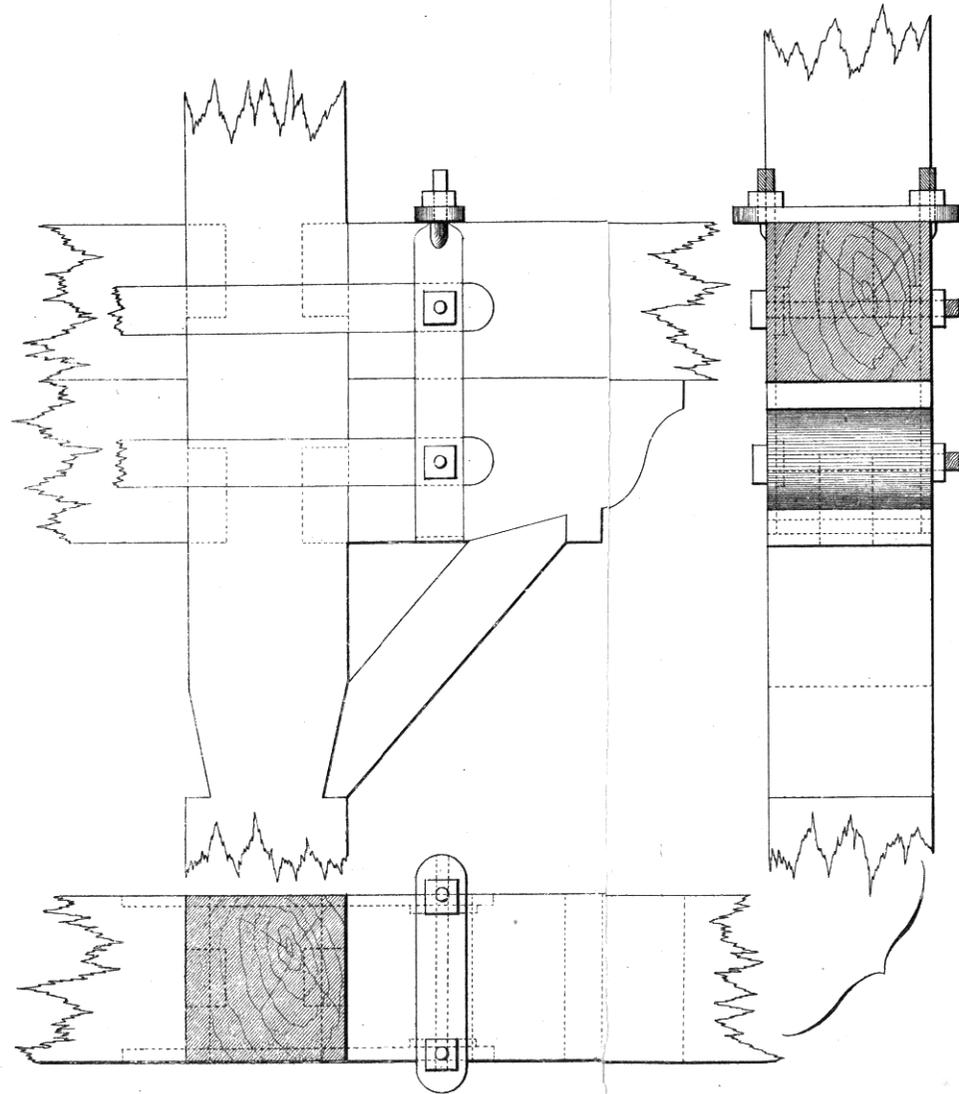


Fig. 21

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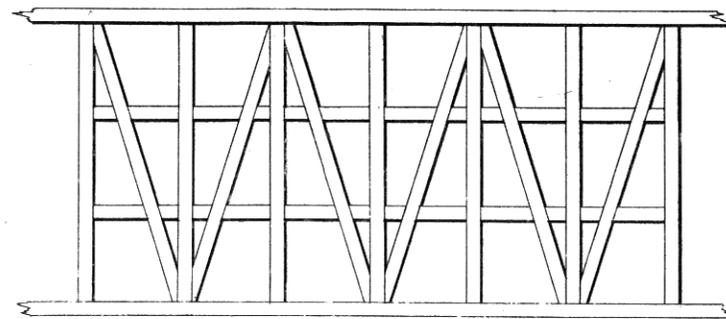


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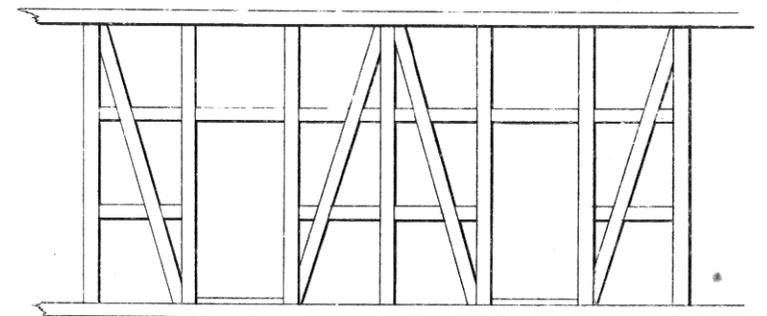


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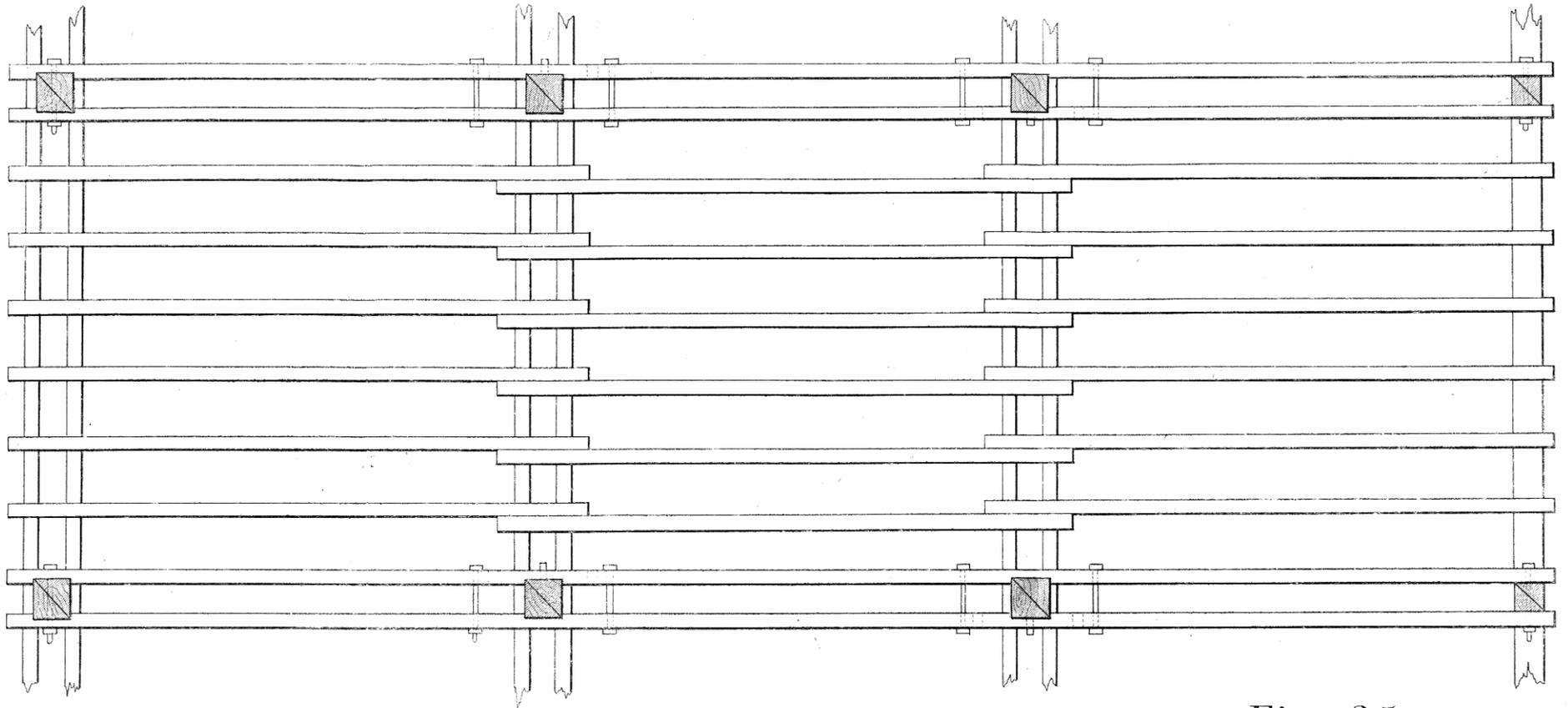


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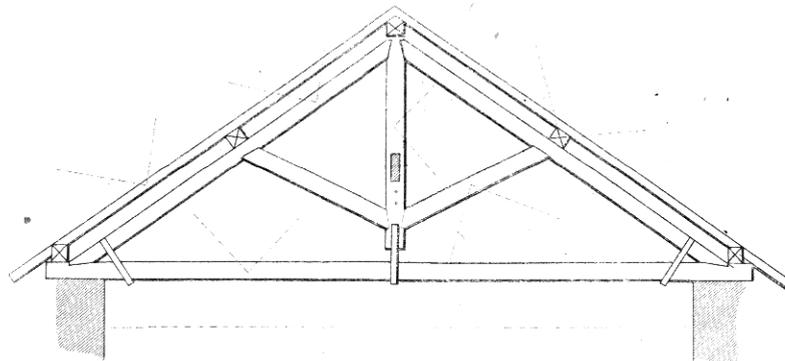


Fig. 25

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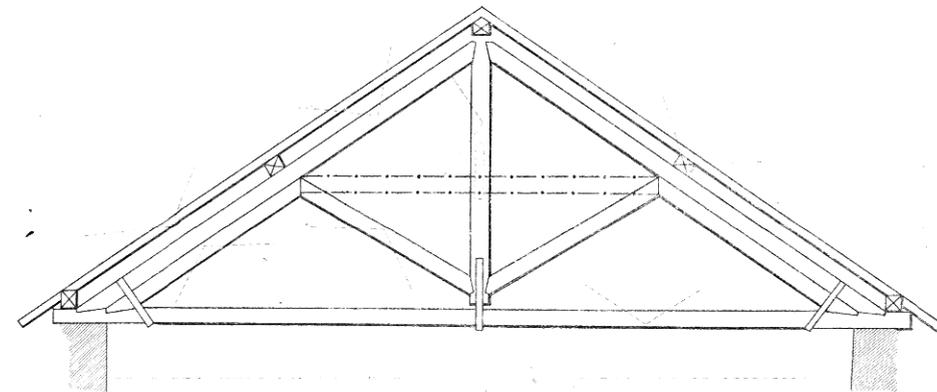


Fig. 26

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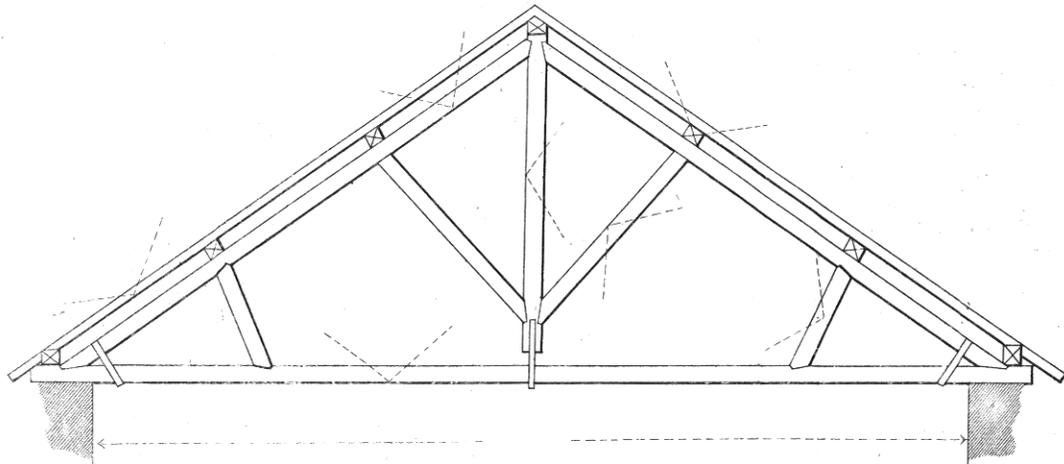


Fig. 27

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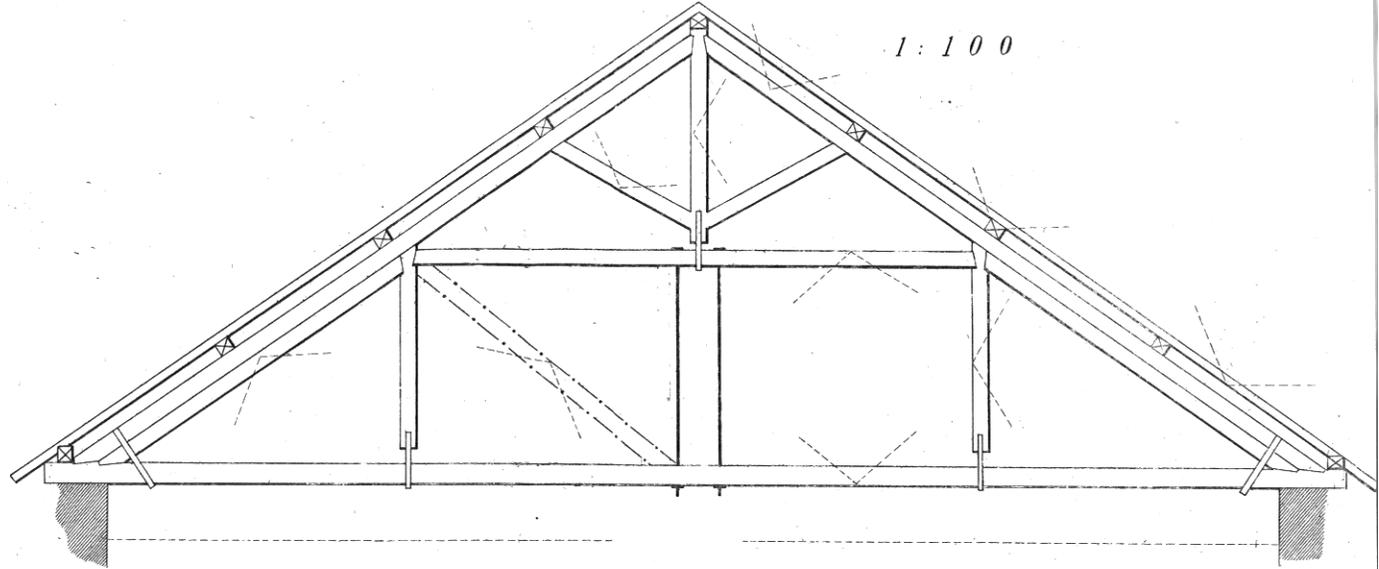


Fig. 28

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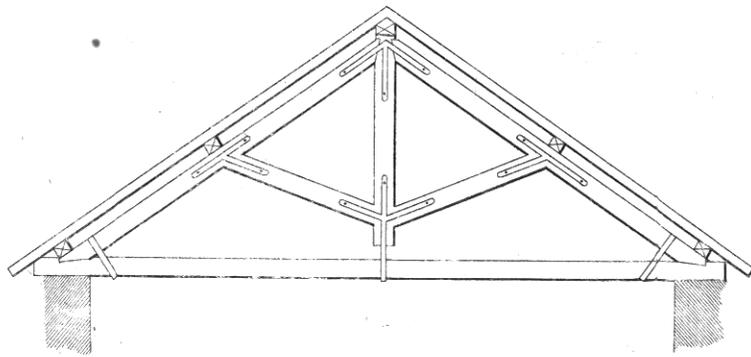


Fig. 29

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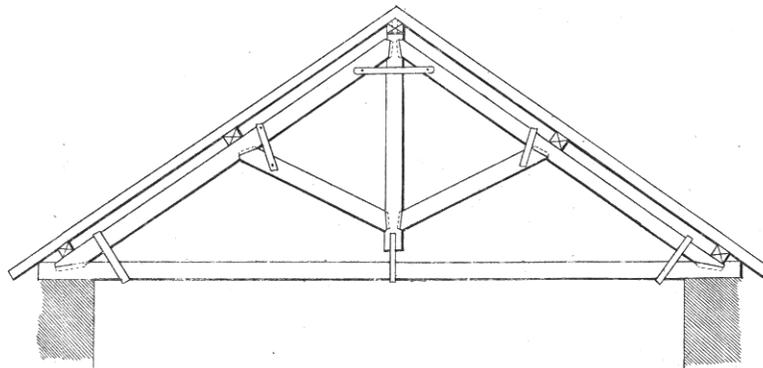


Fig. 30

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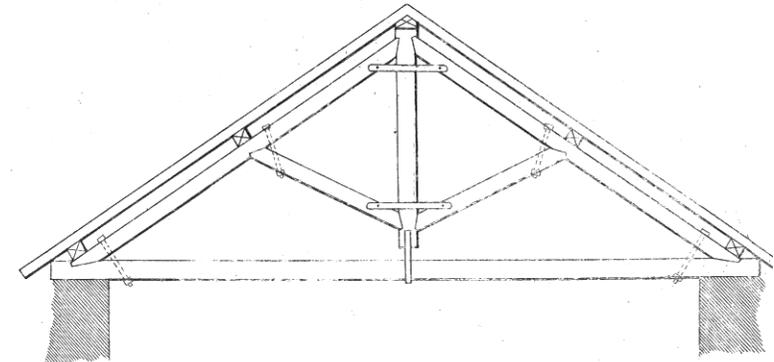


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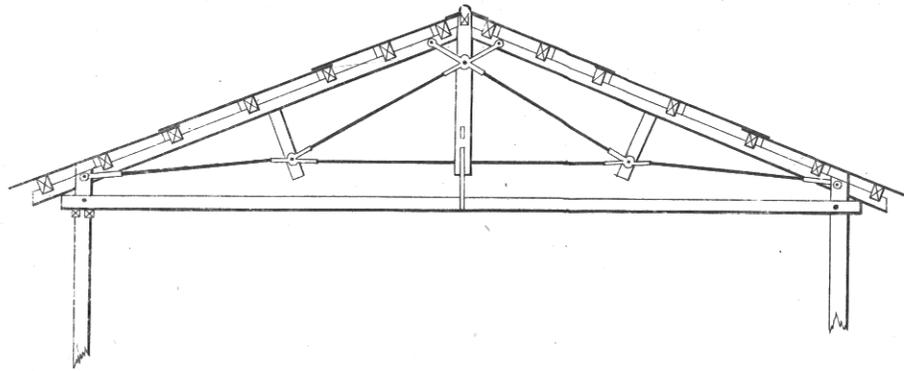


Fig. 32

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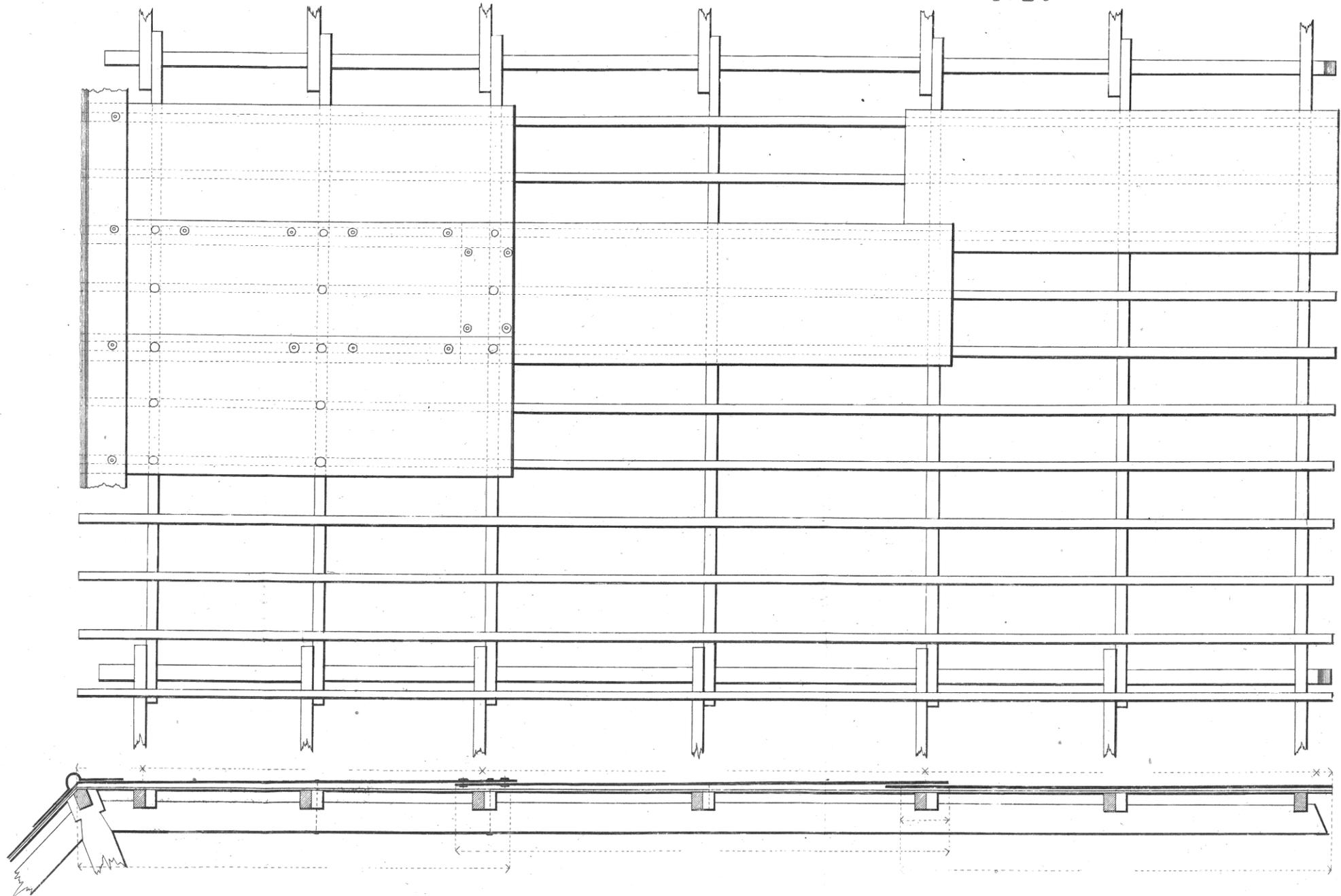


Fig. 33

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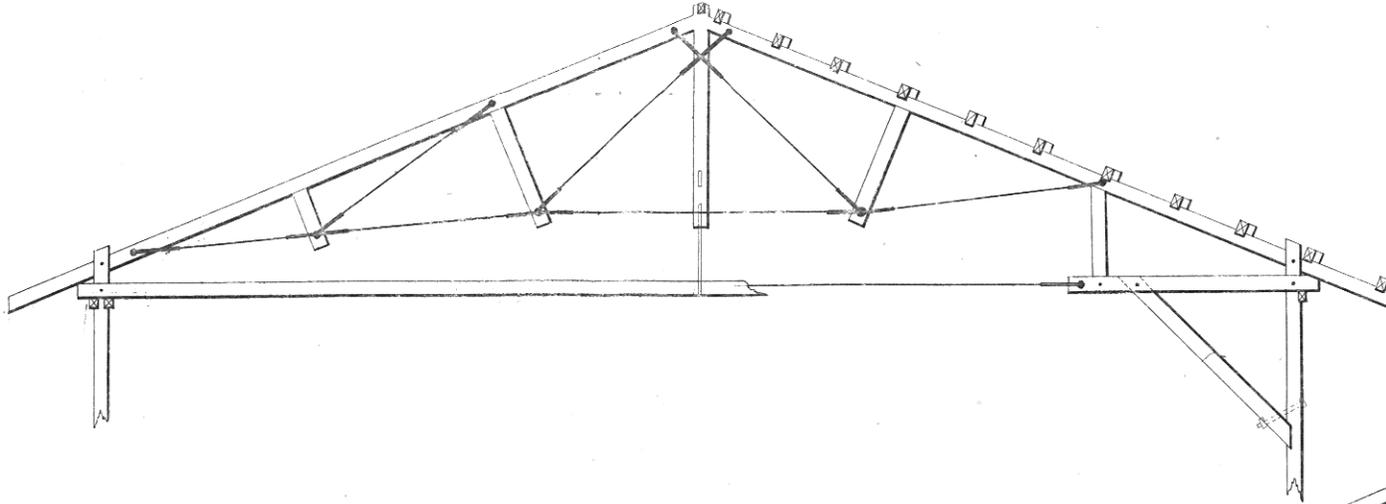


Fig. 34

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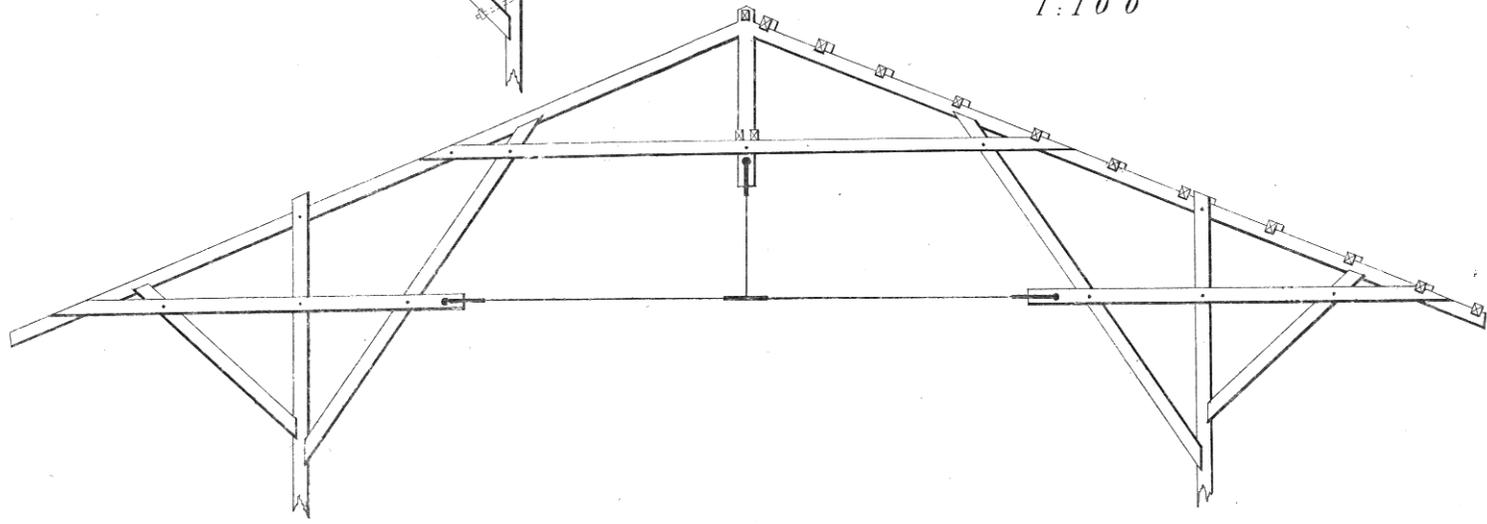


Fig. 35

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