N° 127 A.D. 1915

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COMPLETE SPECIFICATION.

Improved Means for Lighting Theatrical Stages and other Areas.

I, HARALD DOHRN, of Hellerau, bei Dresden, Germany, Gentleman, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention has for its object to provide an improved means for illuminating more particularly theatrical stages, by means of which a diffused but also extremely intense light can be produced, the effect of which is approximately equal to that of diffused daylight as regards the resulting illumination and manner of lighting. The improved means gives considerable advantages owing to the absence of light cones and reflections which are so disturbing with the usual manner of lighting, and of all shadows, and it is also distinguished by the fact that it allows of producing peculiar delicately shaded colour effects capable of a great variety of graduations by means of comparatively simple devices.

The essential feature of the present invention consists in a large number of single sources of light, for instance electric glow lamps equally distributed midway between two surfaces situated at a suitable distance apart, of which that surface which faces the space to be illuminated, is composed of a translucent flat fabric, whilst the other surface is adapted to reflect the light in a diffused manner upon the first mentioned surface.

For the purpose of producing coloured light effects a second source of light from coloured lamps is allowed to act upon the surface which it is desired shall be diffusely lighted, thereby producing a diffused illumination of different coloured light. This may be done either by arranging a second surface giving diffused light of a different colour in such proximity to the first lighting surface as to cause the light effects of both of the lighting surfaces to act upon each other in the desired manner, or by illuminating a surface diffusely lighted in one colour with sources of light of other colours from the back in such a manner that the surface projects diffused light of mixed colour from the side facing the stage. It has now been found that this gives a peculiar result, namely that the mixed colours do not produce mixed shades according to the colour theory, but produce shades of quite other colours. In this respect an especially surprising effect is produced by the mixture of coloured, for instance blue or green, light with uncoloured light.

For example, if the surface in question be illuminated with diffused blue light, and the said surface is gradually illuminated from behind uniformly with white or uncoloured light, the blue tint will pass gradually through red to pink as the white light increases in intensity, before the white light has obtained complete preponderance.

In this respect the absolute intensity of the coloured light that is employed is also of importance. For instance, if a powerful blue light be employed, pronounced violet shades will be produced in passing from pink to white. In

[*Price 6d.*]

this manner for instance sunrise effects can be represented very effectively, wherein the changing colours are particularly distinguished by their delicate transparent shades. In producing a sunset effect the procedure is reversed, the white light being gradually weakened, and thereby first pink, and then red shades being produced.

The practical execution of the improved process is considerably simpler than the processes hitherto used for these purposes, because it is only necessary to alter both the intensity and colour of one source of light, and a variation of the intensity alone is sufficient of that kind which can be produced in the case of electrical illumination in a very simple manner by means of a resistance or the like.

When green is used as the basic colour, an increasing illumination with colourless light gives a colour shade which changes gradually from bright orange to white. Similarly, the different shades or colours of light may be effected by mixing one or more basic colours with colourless light. A condition for this purpose is the use of sources of light giving a diffused coloured light.

Some constructional examples of apparatus for carrying the invention into effect are illustrated in the accompanying drawings, in which:

Fig. 1 is a plan of a theatre stage provided with the improved illuminating apparatus.

Fig. 2 shows on a larger scale a device for suspending and distributing the sources of light behind the lighting surfaces.

Fig. 3 is a vertical section of a staircase provided with the improved lighting apparatus, as an example of the application of the improved method for lighting from underneath.

Figs. 4 and 5 are respectively a perspective view and a side elevation of a portable form of the improved lighting apparatus.

In the example shown in Figs. 1 and 2 the sides 1, 1 and the back 2 of the stage are covered with light-coloured, preferably pure white, cloths 3. Any window apertures 4 that may be existing are preferably covered first with a dark material covered on its inner side with a white cloth.

At a distance of about one metre from the cloths 3 and parallel to them there are arranged further surfaces 5, preferably composed of single cloths but which may consist of a number of jointed pieces suspended from the ceiling and consisting preferably of fire-proof white cotton fabric.

Between the cloths 3 and 5 as near as possible in the middle, there are arranged the single sources of light consisting of glow lamps 6. These glow lamps, as shown in Fig. 2, are mounted in rows upon bars 7 of which a large number are suspended side by side from rods 8 situated near the ceiling. The bars 7 are formed with hooks 9 by means of which they engage loosely with the rods 8 so that the bars can be shifted as desired along the rods. The supply leads for the glow lamps are made movable accordingly.

Instead of the cloth covering 3, the walls may be painted in a suitably light colour. Care must however be taken to prevent any pronounced reflection effects; for instance a shiny coat of oil paint must be avoided.

It is obvious that glow lamps with colourless glass bulbs as well as with any desired coloured glass bulbs may be used. The different coloured bulbs may be grouped in any desired manner so as to produce various mixed colour effects. Devices may also be provided for enabling single glow lamps or entire groups of lamps to be thrown into and out of operation and also to be graduated as regards their lighting effect as desired.

If it is required for instance to produce upon the background of the stage coloured pictures of definite shape, such as a rainbow, then the glow lamps which are arranged in large number uniformly distributed behind the transparent surface, may be isolated from one another in any suitable manner by means of screens adapted to the shape of the picture to be represented, so as to produce a demarcation between the various colours. The different colours

of the sources of light are produced by suitably coloured screens or preferably by means of the coloured glass bulbs for the glow lamps. The glow lamps are arranged in groups according to the different colours with separate switches and resistances.

The improved means also allows of illuminating very effectively with coloured light any parts or articles located on the stage itself, side scenes, movable scenery, set pieces and the like, in which cases the absence of any inconveniences caused by projection is of special importance.

In the modification shown in Fig. 3, it is required to light the steps of a staircase from underneath. The staircase is formed of a stepped framing 11, the treads of which are covered with gratings 12 constructed in the manner of the well known boot scrapers. The bars of these gratings which are set on edge are held in place in the usual manner by means of cross rods 13 provided at suitable intervals apart, and are preferably arranged transversely to the length of the theatre, so that the audience looks upon the broad sides of the bars. The gratings may be covered also with wire netting to facilitate walking on them.

Under the treads there are stretched two parallel cloths 14 and 15 between which glow lamps 16 are uniformly distributed, the glow lamps being mounted on bars 17 extending transversely of the staircase. The glow lamps 16 should be situated as much as possible midway between the two cloths so as to produce a uniform distribution of the light upon the upper surface 14. The cloths are arranged on the left side of the drawing parallel to the treads (formed by the grating 12) of the steps of the staircase, whilst on the right side of the drawing they are shown arranged in an inclined position corresponding to the gradient of the staircase. In the latter case the light-diffusing cloths are situated at a suitable distance from the gratings, but the light effect is scarcely affected hereby. The risers 18 of the steps of the staircase are opaque in order that they shall not contrast as regards their lighting effect, with the treads whose lighting effect is, owing to the gratings, naturally somewhat smaller than that of translucent surfaces 14.

In the case of flat floor surfaces, these are naturally covered at a uniform level with the gratings, and the upper cloth 14 is arranged directly under the gratings.

Obviously any other gratings may be employed instead of the gratings formed of bars set on edge, but the gratings shown in the drawings have been found to be extremely efficient as regards the production of a uniformly illuminating floor surface. The production of shadows by the various members of the grating is prevented in any case by the use of a light-diffusing surface as the source of light.

Figs. 4 and 5 illustrate a lighting apparatus which can be carried in a very simple manner to the spot, and can if desired be removed with equal ease. This apparatus allows of employing the improved lighting method for set pieces, stairs, walls and the like situated on the stage itself. Care is taken that these set pieces, which when in use must naturally have a certain width determined by the distance apart of the surfaces that enclose the glow lamps, shall occupy only a very small space when out of use and can be stored away in this condition for instance be hoisted up into the flies, or loft.

A rectangular cloth 19, constituting the lighting surface, is stretched between the free ends of four cross pieces 21 which are connected together by wires 20, so as to form a frame, and which are pivoted in the middle to the four corners of a frame 22. The frame 22 carries by means of vertical cross pieces 23 the glow lamps which are employed for lighting and which are connected to a plug contact piece 25 on one of the vertical posts of the frame. At the rear end of the cross pieces 21 there is pivoted a second frame 26 which serves to hold the reflecting cloth surface. The frame 26 is stiffened in itself by means of cross pieces 27, 28 and stays 29. This stiffening acts also to stiffen the

frame which is formed by the connecting wires 20 of the front ends of the cross pieces 21.

A device for fixing the several parts of the structure relatively to one another is provided between one of the cross pieces 21 and the frame 22. This device consists, in the construction shown, of an arc-shaped bar 30 attached to the cross piece 21 and engaging through a staple 31 mounted on the vertical post of the frame 22. The quadrant bar 30 is adapted to be clamped in position by means of a screw working in the staple 31. At the upper end of the said post of the frame 22 a stop 32 is provided to prevent the cross piece 21 from turning beyond the horizontal in the direction of the hands of a watch.

To the front ends of the two top cross pieces there are connected wires 33 which serve for hoisting up the entire structure when it is to be removed from the stage. These wires 33 do not engage directly with the cross pieces, but with short upward extensions 34 of the cross pieces 21.

When the apparatus is to be removed from the stage, it is hoisted up by means of the wires 33, after the fixing device 30, 31 has been first undone. In this hoisting movement the cross pieces 21 turn on their pivots, and the two outer frames fold back flat upon the inner frame 22, so that the entire structure takes up very little space as regards width, and can be conveniently stored in the flies. The extensions 34 with which the wires 33 engage, act as shown in Fig. 5, to bring the centre of gravity of the entire structure in line with the wires, and thus avoid a tilted position of the folded structure.

Other wires or the like may be attached to the frame 22, as shown at 35, fitted in the usual manner with counterweights for the purpose of balancing the weight of the structure.

It is to be understood that the construction of the folding structure may be of any desired kind as regards its external shape, which varies according to the particular shape of the set piece to which it is to be applied.

It should here be noted that I do not claim broadly apparatus in which distributed glow lights are arranged between a translucent surface and an opaque reflecting surface; nor do I claim broadly the diffused lighting of a stage from beneath it.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. Means for lighting theatrical stages and other premises, comprising two parallel surfaces, midway between which sources of light, preferably electric glow lamps, are arranged in uniform distribution, and of which that facing the space to be lighted is formed by a translucent flat fabric whilst the other surface is adapted to reflect the light in a diffused manner.

2. An apparatus in accordance with Claim 1, comprising two parallel stretched cloth frames, midway betwen which electric glow lamps are arranged in uniform distribution, one of said cloths being translucent and the other reflecting.

3. An apparatus as claimed in Claim 2, wherein the glow lamps are mounted on a frame to which the cloth frames are connected in a folding manner.

4. An apparatus as claimed in Claim 3, wherein the two cloth frames are connected to each other by means of cross-bars pivoted to the lamp frame and form jointed parallelograms, so that the three frames are caused to fold together when the entire structure is hoisted by means of a rope or the like attached to one of the two cloth frames.

5. An apparatus according to either of Claims 2 to 4, wherein the reflecting cloth frame is strutted or stayed in itself in such a manner as to render unnecessary any separate stiffening of the light-diffusing cloth frame connected to it by the jointed intermediate members, so that the surface of the light-diffusing cloth can be kept free of all shadow-forming stretching and the like devices.

6. An apparatus according to either of Claims 4 or 5, wherein two relatively movable members of the jointed parallelogram are made relatively adjustable, for the purpose of rendering the entire framework rigid during use.

7. An arrangement or apparatus in acordance with Claim 1, wherein the glow lamps are arranged to give both colourless light and coloured light, the latter being preferably blue or green light.

8. An apparatus in accordance with Claim 7, wherein colourless and coloured glow lamps are arranged in groups, are adapted to be thrown into and out of operation and are provided with means whereby the intensity of the different groups may be varied for the purpose of producing a coloured illumination in different or varying shades.

9. An arrangement or apparatus in accordance with Claims 1, 7 or 8 having in combination a floor structure arranged above it, said floor being constructed of grating composed of bars set on edge.

10. An arrangement or apparatus in accordance with Claim 9, for lighting staircases wherein the lighting surfaces are arranged in an inclined manner corresponding to the gradient of the staircase.

11. The improved apparatus for lighting stages and other areas constructed substantially as hereinbefore described and also as illustrated in and by the accompanying drawings.

Dated this 1st day of January, 1915.

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DOHRN'S COMPLETE SPECIFICATION.

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[This Drawing is a reproduction of the Original on a reduced scale]

Fig.1

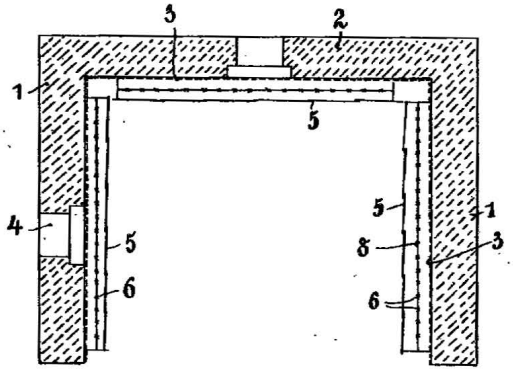


Fig.2

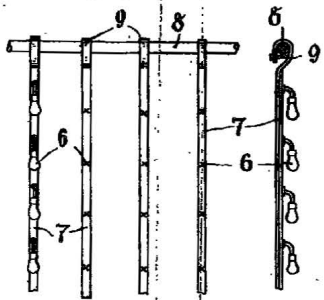


Fig.3

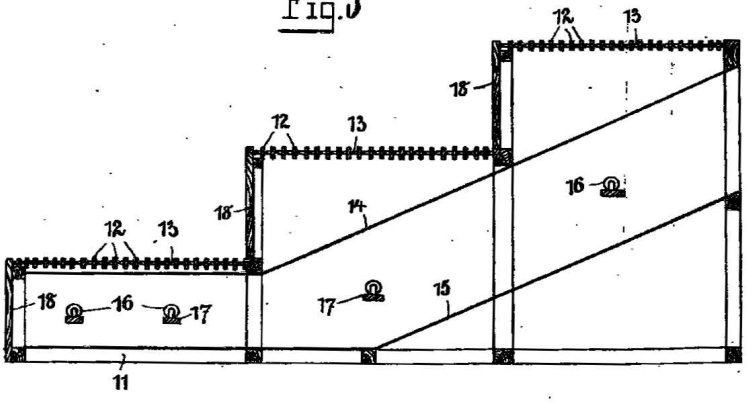


Fig.4

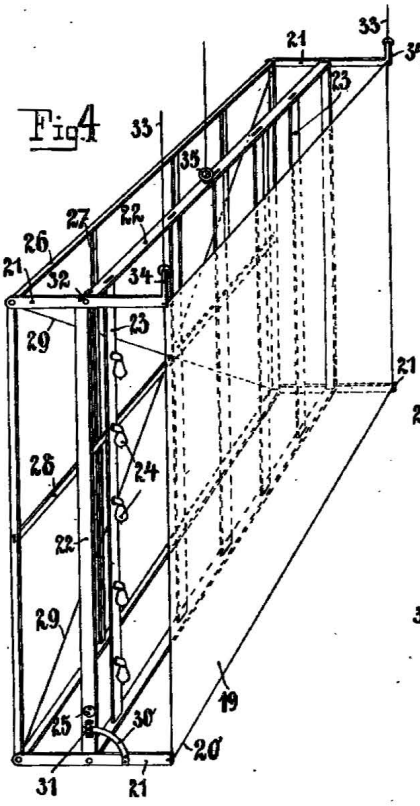
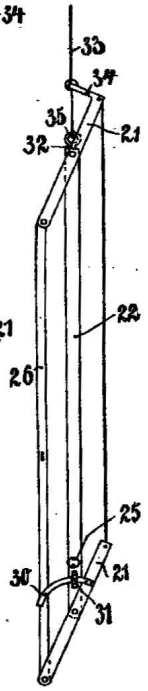


Fig.5



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[This Drawing is a reproduction of the Original on a reduced scale.]

Fig. 1

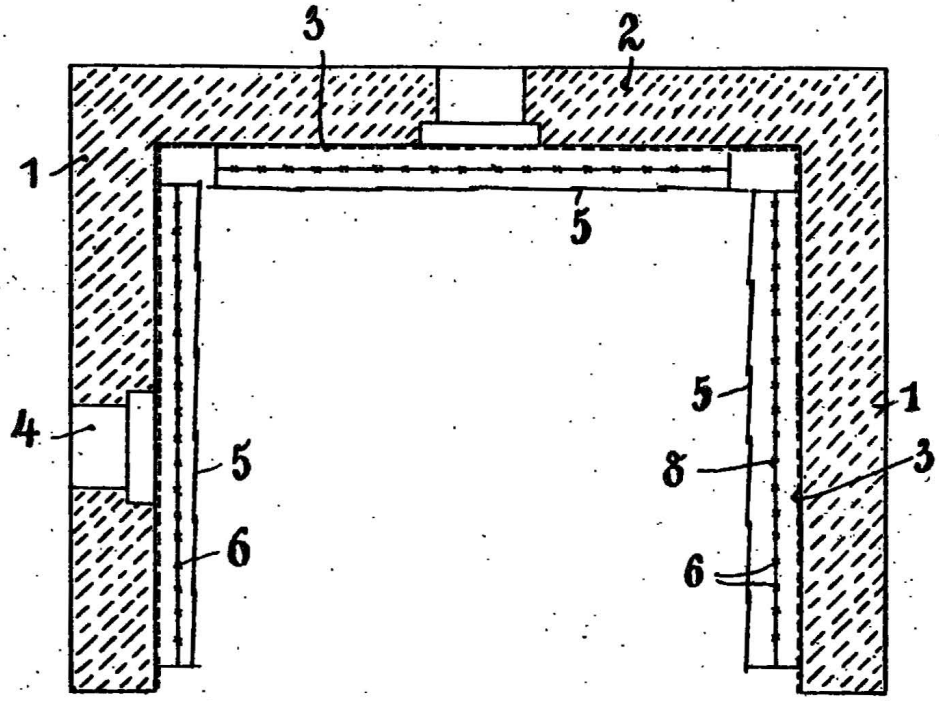


Fig. 2

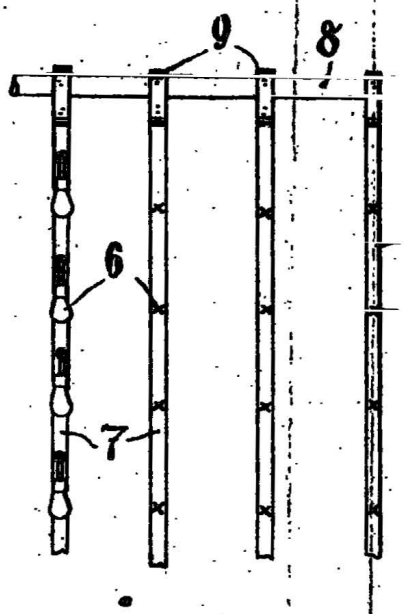
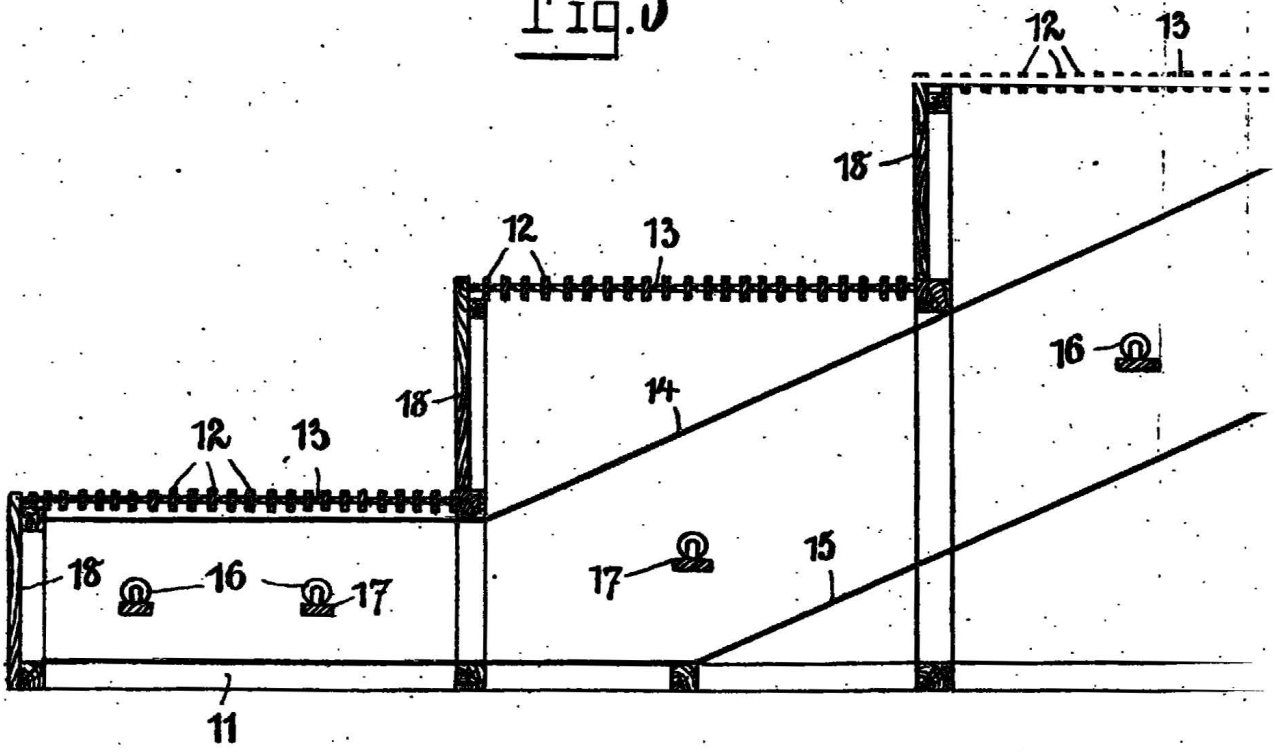


Fig. 3



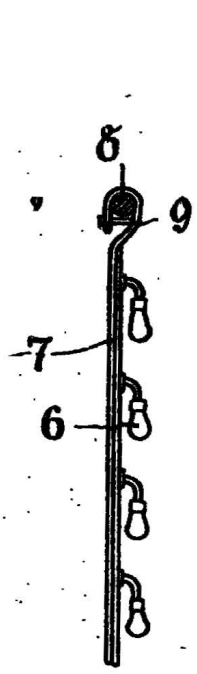
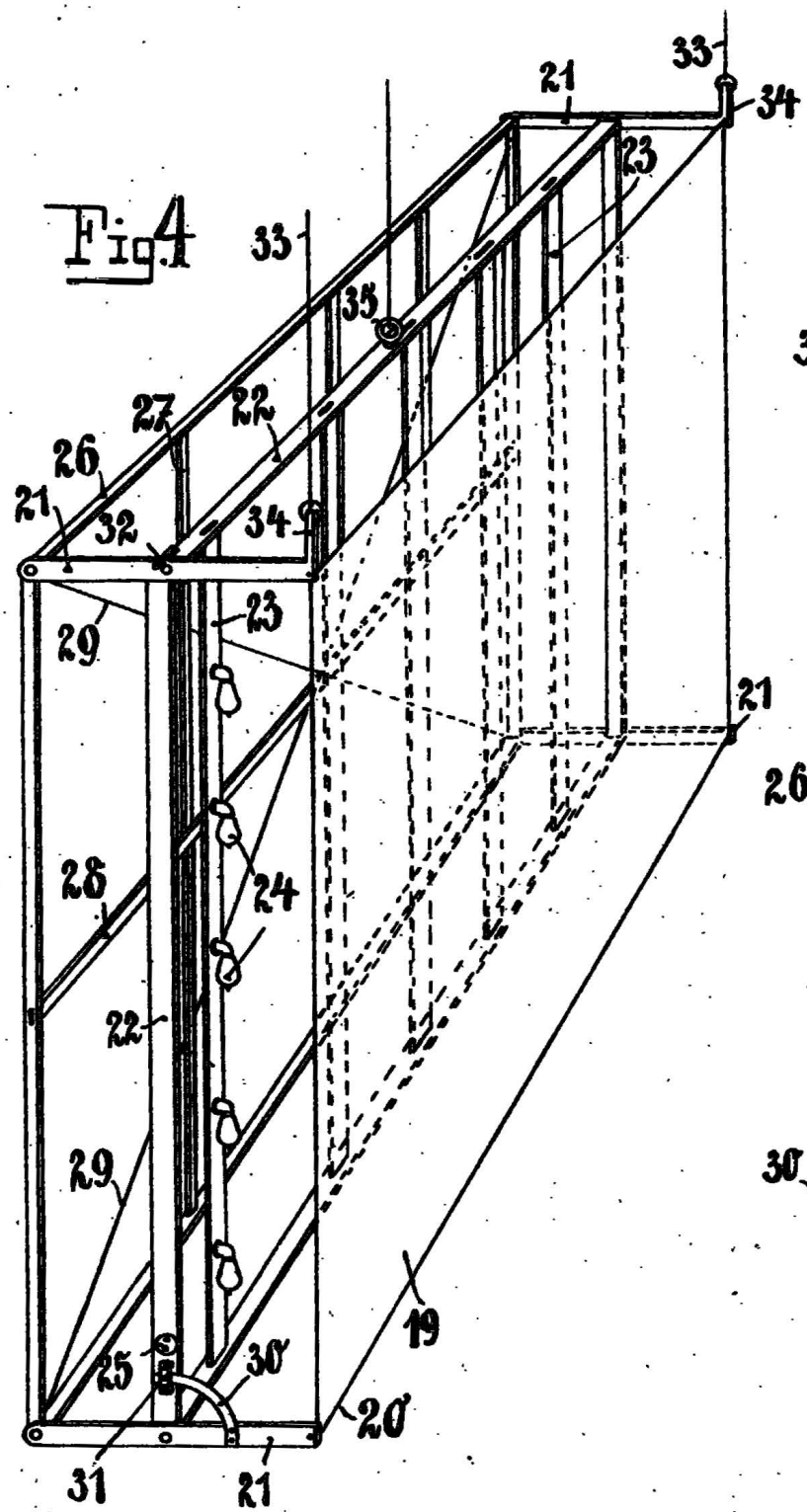


Fig.4



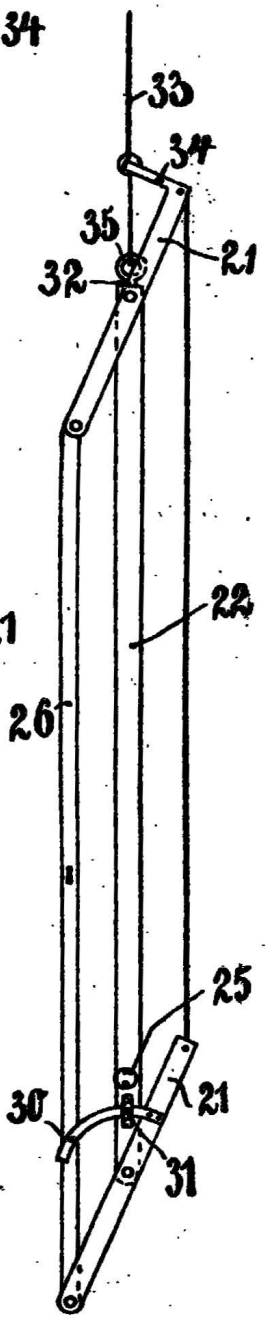


Fig.5

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