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PATENT SPECIFICATION

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PROVISIONAL SPECIFICATION.

Improved Means for Developing Cinematograph Films.

I, WILLIAM CECIL JEAPES, of 76 and 78, Wardour Street, London, W., Cinematograph Expert, do hereby declare the nature of this invention to be as follows:—

This invention relates to improved means for developing cinematograph films it being particularly adapted for developing positive films.

According to the invention the film strip preferably having the known perforations is passed through the bath or baths or drying chambers in loops which loops are weighted at their free ends to take up expansion of the film due to wetting and which at their opposite ends to the weight are passed (preferably outside of any bath employed) over rollers or the like having means for holding the film while passing over same such for example as pins at each edge which momentarily engage the perforations.

Preferably in order to obtain a long travel in a tank the film may pass from one roller down into a loop up to another roller side by side with the first and on the same shaft and so on to the width of the tank each loop being suitably weighted.

Preferably also where the film leaves a bath to pass to another or leaves one roller or set of rollers to pass to another roller or another set of rollers which it would usually do in a horizontal or perhaps an inclined direction, means are provided to take up the slack caused by wetting such for example as by allowing the weight in the last loop to act for this purpose by employing a plain exit roller for the bath or the like, and a film holding or pin toothed roller for the entrance of the next bath or the like, whereby the last weight effects the desired stretch over all the film up to the entrance end of the next bath or the like.

The weight carried by each loop is preferably a roller which can rotate freely as the film travels, and such roller has preferably guide flanges to keep it in place or it may be positively guided in the tank of the bath or other part in which it is located.

Such weight acts not only to take up expansion when the film is wet but allows for contraction in the drying of same.

Dated this 14th day of November, 1916.

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Chartered Patent Agent,
For the Applicant.

[*Price* 6*d*.]

COMPLETE SPECIFICATION.

Improved Means for Developing Cinematograph Films.

I, WILLIAM CECIL JEAPES, of 76 and 78, Wardour Street, London, W., Cinematograph Expert, 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 relates to means for developing cinematograph films.

The method of developing cinematograph films at the present time necessitates frequent handling of the film in that, in the first place the exposed undeveloped film is first cut into predetermined lengths, each length being then wound spirally, for example, on a rectangular frame, the two ends being pinned to the frame. The frame is then bodily immersed by hand in the various baths for developing, fixing, washing and the like. For drying, the film is removed from the rectangular frame and wound on a drum built up of laths, the free ends again being pinned. After drying, the film is wound on a spool and removed to the examining, cleaning and joining room, both of which operations are usually done by hand, though the cleaning of the film is at times done in a machine. The films are subsequently wound on spools ready for use.

According to the present invention, beyond the placing of the spool carrying the exposed undeveloped film in position in the machine and connecting the free end to a film which is already in the machine, which film may be a spoilt film and used constantly for this purpose, or to the end of another film being developed, it is not necessary to handle the film until the spool containing the finished film is removed from the apparatus.

It has heretofore been proposed in connection with the development of cinematograph films to pass the film around two long parallel rollers having a series of guide flanges on each, the film being extended in spiral or helical form, and so disposed that the sensitized surface of said film does not come into contact with either of the rollers, the lower roller being mounted so as to be free to fall and thus take up any slack that may occur in the film.

With this arrangement however, the film not expanding or contracting equally throughout its length, the film falls away from the rollers in loops of varying length.

To overcome this difficulty it has been proposed to develop and fix cinematograph films in a machine comprising a plurality of vertical tanks of relatively great height divided into a number of units, respectively containing the various baths employed in the development of the film, said tanks being arranged side by side in a continuous length and in the same plane and provided with pipes necessary for ensuring proper circulation of the fluids in the series of tanks comprising each unit; the film to be developed, which unrolls from a reel, is guided on mechanically driven propelling pulleys and descends successively into the various tanks, being kept stretched therein by heavy rollers, suspended in equilibrium in the lower part of the loops formed by the film in the different tanks; clutches are included in the driving mechanism for the purpose of regulating as desired the duration of immersion of the film in the developer.

In the machine above referred to, the arrangement is such that the sensitised side of the film is in contact with the propelling pulleys or the stretching rollers, with the result that the film is liable to become scratched or otherwise damaged. The film is dried by passing same over a drying tube.

According to the present invention it is proposed to simplify the operative and controlling parts of a developing machine of this last named type and to so

arrange the parts thereof that the sensitized side of the film does not come into contact with any of the driving or weighting rollers or other metallic part of the apparatus while in a wet condition, thereby preventing the scratching of the film due to the abrasive action of any of the working parts; the film, when developed, fixed, rinsed and tinted being dried in an enclosed chamber through which heated air is drawn in any desired manner.

In carrying out this invention it is proposed to pass the film strip, preferably provided with the known side perforations, through the developing, fixing, washing and like baths and drying chamber or chambers in a continuous length, the film being arranged to hang in loops from a plurality of driven shafts, the free or lower ends of such loops being weighted so as to maintain said loops in the desired position and to take up any longitudinal extension of the film due to wetting, or allow for contraction on drying. The upper ends of such loops are passed over spools, rollers or the like, preferably located outside of any bath employed, some of such spools or the like being furnished with means, such as pins, thereby forming a sprocket, for engaging the perforations in the film, for positively holding the film during its travel.

In order to enable the film to remain for a sufficient time in any particular bath or chamber without unduly increasing the height of the apparatus, a plurality of spools may be provided on each of the shafts located outside the several baths or within a chamber, the film falling from each shaft in a number of loops each of which is weighted, and in order to permit the film to pass through the machine without bringing the sensitized side thereof into contact with any of the rollers, at least two spools must be provided on each of the driving shafts, or one on the driving shaft and one on a supplementary shaft.

The accompanying drawing illustrates diagrammatically, a film developing plant arranged according to this invention.

The several parts of the plant illustrated which occupies three small rooms, the dark room 1, washing chamber 2, and drying chamber 3, will be described in the order in which the film passes through same.

The spool 4 carrying the exposed undeveloped film 4^x is placed on the spindle 5, the free end is connected to a film already in the machine and is passed through an adjustable gate or clamp 6 by means of which the pressure or drag on the film may be regulated. The film passes from the gate around a pin spool mounted on the driven shaft 7 and forms on the underside thereof a loop 8, which loop is weighted by means of a spool 9, arranged so as to rotate freely as the film travels, such spool is provided with deep flanges to keep it in place or it may be positively guided in the tank of the bath or other part in which it is located. The film then passes over a plain spool, or if it is desired to have more than one loop in the same bath, over as many more pin spools on the shaft 7 as may be desired, each loop formed being weighted with a spool 9.

The loops 8, with their weights, are immersed in the developing bath 10, and the number of loops or length of film determines the time taken by the film to pass through the developer, assuming that the travel is maintained constant. The film, as it leaves the bath 10, passes up and over a plain spool 11, but in order that the film may pass horizontally to the next series of spools on the shaft 12, the plain spool 11 may be disposed horizontally with respect to the series on the shaft 12, on a supplementary shaft, as shown at 11^x by dotted lines, but this is optional as the film may pass directly from the plain spool 11 to the first toothed spool on the shaft 12. From the spools on the shaft 12 the film passes in a loop or loops, weighted as before with a spool or spools 9, into a bath 13 for washing the film. From the plain spool on shaft 12 the film passes to the first toothed spool on a shaft 14 from which it hangs in loops, weighted as before, in a fixing bath 15. In order to provide for the complete fixation of the film a second shaft 16 with a further series of spools and loops may be provided, and, from this last series of spools the film passes either directly to the spools on the shaft 17, or as shown by dotted lines over the plain spool 16^x, to the washing chamber 2. The weighted loops from this series

of spools are suspended in the washing bath 18. Floating on the surface of the bath and located between the two inner faces of the film, that is, the non-sensitised side, is a bar or roller 19 covered with wash-leather or other desired material for cleaning the back of the film, the size of said bar or roller being such that it is caused to rotate by the rubbing action of the film against same. To further assist in the proper washing of the film, a spraying device 20 is provided above the spools on the shaft 17, the water therefrom running down the film.

As it is frequently desired to tone or stain the film, after washing, the film may pass to a further series of spools on a shaft 21 and be arranged to hang in loops, weighted as before, which loops may be immersed in any desired toning or staining bath 22. The film now passes to a further series of spools on a shaft 23, located in the drying chamber 3, and in its passage it may pass between a pair of removable rollers 24, 25, covered with an absorbent material for the purpose of taking up some of the water or other liquid with which the film is charged, such rollers are not however essential. As before the film is caused to hang in loops from the spools on shaft 23, weighted as before. Near the bottom of the loop a dry wash-leather covered roller 26, which may be fixed or caused to rotate in the reverse direction to the travel of the film, is supported in any desired manner between the loops for the purpose of polishing the non-sensitised side of the film. From the spools on shaft 23 the film may pass to a further series of spools on the shaft 27 hanging therefrom in loops as before.

Hot air is drawn into the drying chamber 3 by means of a fan 28 and extracted by a second fan 29.

From the drying chamber the film passes to the spool 30 in a finished condition.

As soon as the film on the spool 4 is run out the free end of a film on a second spool 31, mounted on a spindle 32 arranged directly below the spindle 5 may be connected to the end of the first film and so on, it being advisable, as will be readily understood, to always keep a length of film, preferably a spoilt length, in the machine so as to act as a guide and to save any further handling of any film once the machine has been in operation.

It will be understood that the driven shafts 7, 12, 14, 16, 17, 21, 23 and 27, which may all be arranged in the same horizontal plane, may be provided with two or more spools, but, in each case, in order to take up any slack or extension caused by the wetting of the film, or to allow for any contraction on drying, the spools are so arranged, that, the entering spool, on any shaft, that is, the first spool receiving the film shall be a sprocket, that is, a spool provided with teeth, and, the exit or last spool of any series shall be a plain spool, with the exception of the last spool on the shaft 27 which is toothed, so that the last weight 9 of each series effects the desired stretch or tension on the film from the last toothed spool on the one shaft to the first toothed or entering spool on the succeeding shaft.

It will be further understood that the number of driven shafts may be varied as desired, for example three or more series of loops may be arranged in the fixing bath, two or more in the washing chamber and three or more in the drying chamber, but the arrangement illustrated has been found satisfactory in practice.

The shafts above referred to are all geared together so as to rotate at the same speed, and the driving means may consist of a small electric motor, with a reduction gearing interposed between the rotor shaft and the driven shaft. The spool 30 is driven from the shaft 27 through a friction device so as to allow for the variation in diameter as the film is wound thereon.

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. A process of developing cinematograph films which consists in passing the

film strip through one or more developing, fixing, washing or like baths and drying chamber or chambers in a continuous length while maintaining the film taut by means of weighting spools which are disposed one in each of the loops formed in such film strip, said film strip being so arranged that the sensitized side of the film does not come into contact with any of the driving or weighting rollers or other metallic part of the apparatus while in a wet condition.

2. In apparatus for carrying out the process of developing cinematograph films as claimed in Claim 1, the provision of a plurality of driven shafts each of which is provided with two or more spools at least one of which must be a toothed spool, or sprocket over which the film is arranged to hang in a loop or loops, each loop being weighted so as to maintain said loop or loops in the desired position and to take up any extension or allow for contraction during the various stages of treatment of the film, the sensitized side of the film being arranged to face away from the operative parts of the apparatus throughout its passage therethrough, except as it is passing between the moisture absorbing rollers.

3. Apparatus for developing cinematograph films arranged substantially as described with reference to the accompanying drawing.

Dated this 11th day of May, 1917.

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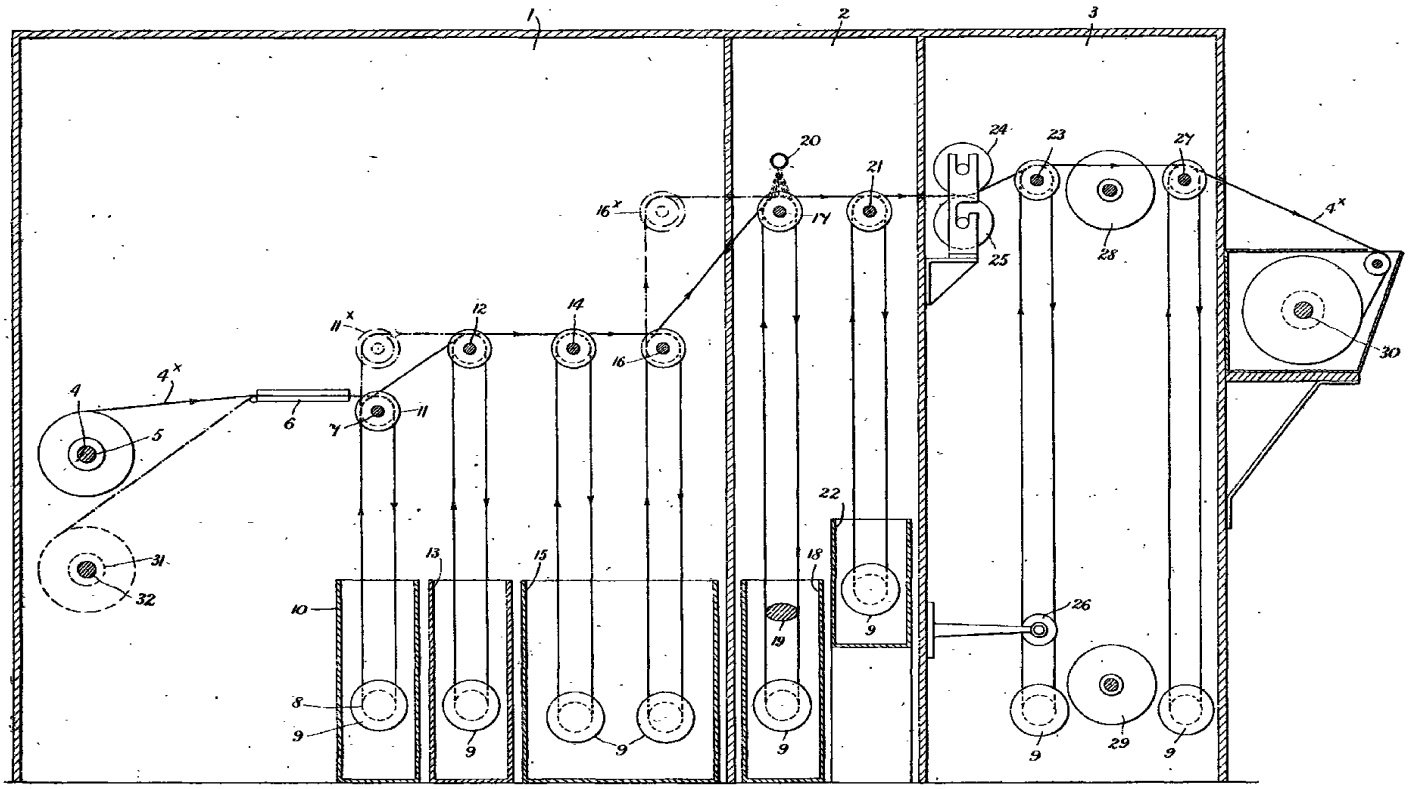
For the Applicant.

Redhill: Printed for His Majesty's Stationery Office, by Love & Malcomson, Ltd.—1917.



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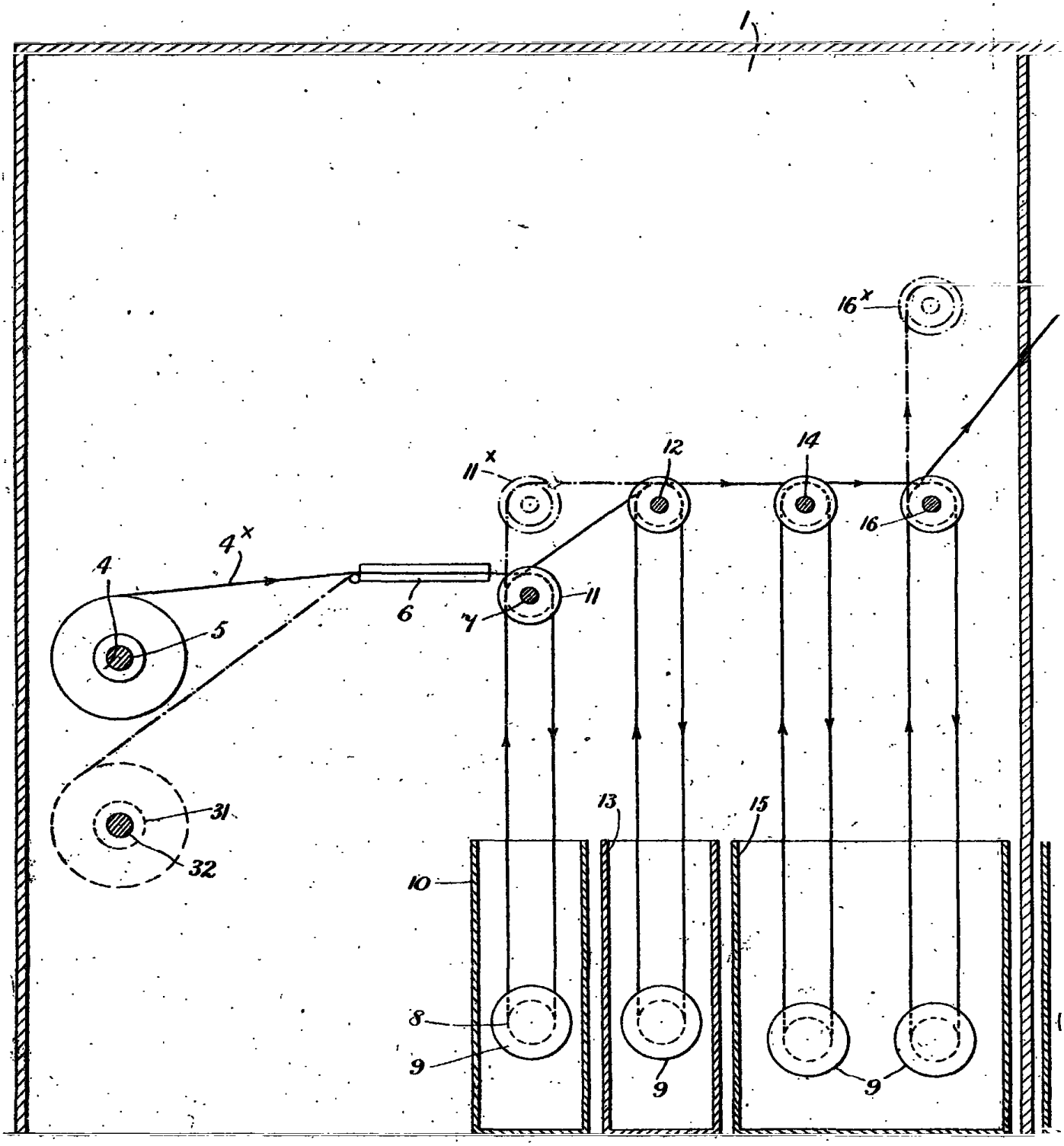

[This Drawing is a reproduction of the Original on a reduced scale.]

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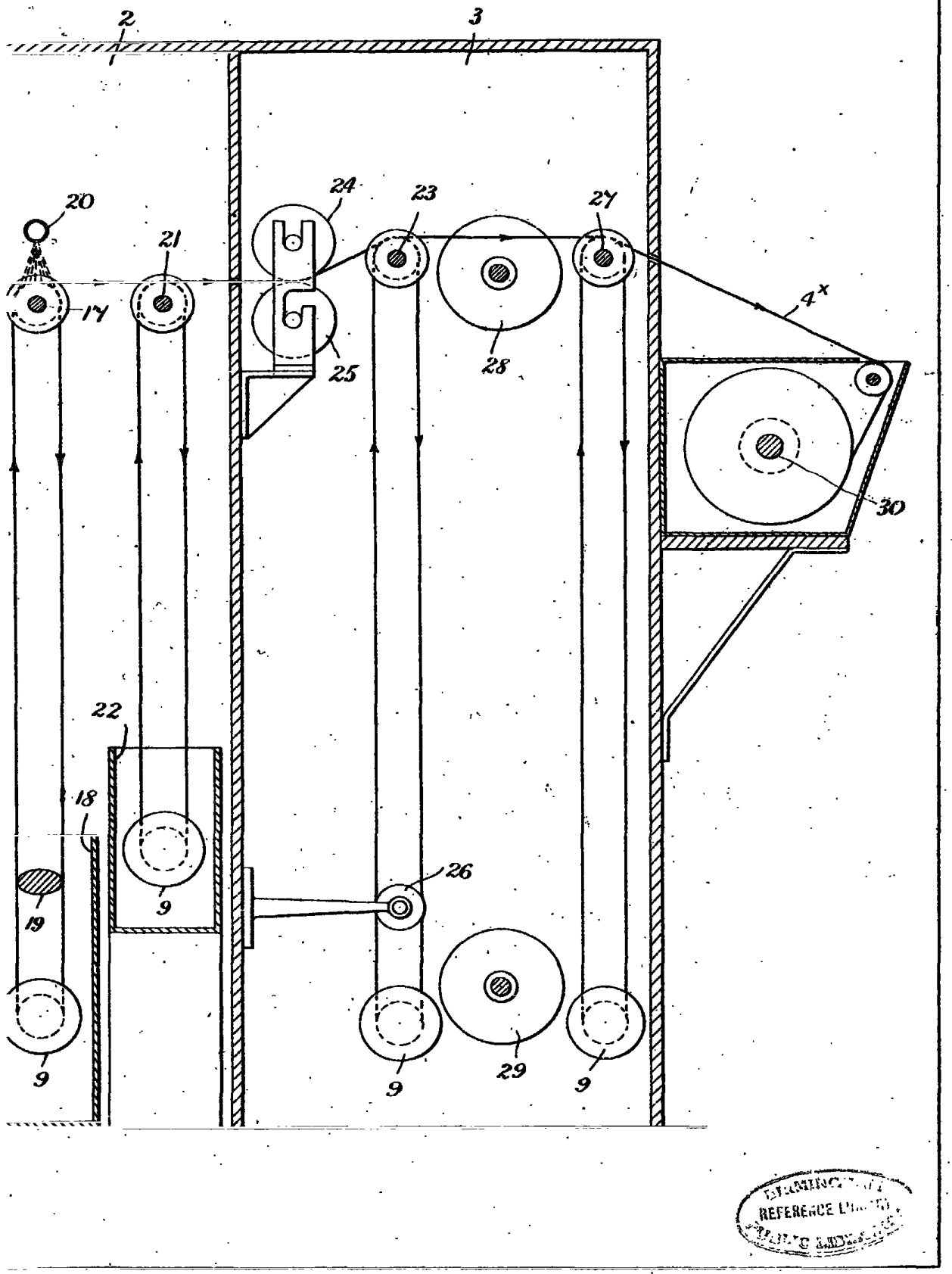

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