

# PATENT SPECIFICATION



Application Date: May 12, 1925. No. 12,362 / 25.

261,054

Complete Left: Feb. 12, 1926.

Complete Accepted: Nov. 12, 1926.

## PROVISIONAL SPECIFICATION.

### Improvements in and relating to the Printing of Cinematograph Films.

I, HERBERT ERNEST COSTON, of 41, Dundonald Road, Brondesbury Park, London, N.W. 10, a British subject, do hereby declare the nature of this invention to be as follows:—

This invention relates to the printing of cinematograph films.

It has for its object to provide an improved printing machine.

The invention consists in a photographic printing machine for cinematograph or other purposes having two lamp houses facing each other for the simultaneous or alternate printing from opposite sides through two or more negative or positive films with means for separately controlling the amount of light reaching either side, preferably by a double automatic or hand light-changing device.

The invention also consists in printing machines substantially as hereinafter described and in films thus printed.

In carrying the invention into effect in one form by way of example a cinematograph printing machine for exposing simultaneously through two or more negative or positive film bands is formed with two lamp houses facing each other, one pivoted to open away from the other. Above the lamp houses mountings for three reels of film are provided and mountings for three reels of film are disposed below the lamp houses. Both above and below the lamp housings there are also mounted sets of three suitably driven sprockets, for example sprockets known as eight-picture sprockets. At the top of the lamp housings film brakes and separators are employed and approximately in the centre of the housings a single aperture is formed and an appropriate gate is placed. Below this for the

purpose of intermittently moving the films there are mounted three sprockets operated by Maltese cross mechanism, these sprockets conveniently being those known as four-picture sprockets. The centre film reel at the top contains the film on which the print is to be made. The reels on either side of it contain the bands from which prints are to be made. The film on the centre reel is a double-coated film and the films on the outer reels may be of any suitable type.

The three films are threaded down through the apparatus, one of the lamp housings being swung away to permit the gate to open for this purpose, so that the ends can be attached to the appropriate lower film reels, the necessary loops being permitted for the purpose of enabling the film reels to be continuously driven while the film is intermittently moved through the gate as is well known in cinematograph practice.

The usual final registration devices for the films, springs for ensuring contact and other accessories may be used as desired.

In each of the lamp housings a suitable lamp is mounted, each being preferably adjustable in position towards and away from the adjacent film. In addition preferably each lamp is provided with an adjustable resistance or the like for varying the intensities of the light and this may be automatically controlled, for example by notches or the like previously formed on the edge of the films, so that stronger illumination is provided at parts of comparatively high density.

Between the lamps and the films appropriate rotating shutters are mounted, these being synchronised, for example by clutching together through a dog clutch.

[Price 1/-]

The drive for the shutters and the drives for the sprockets and film reels may be effected in any convenient way.

In operation the three films are drawn downwards together by means of the Maltese crosses acting in conjunction with the picture sprockets and the middle film is simultaneously printed from both sides through the two film bands, one on each side of it.

In place of this simultaneous printing one lamp may be disposed below the other so that one band is printed at a time and the bands are alternately printed from each side in this way, two or more gates being used as required.

In place of using a film with emulsion

on both sides for the film on which the print is to be obtained a film with emulsion on only one side may be used, the two surfaces of that emulsion acting as the two outer surfaces of the double-coated film. Such emulsion may be specially prepared for this purpose and may take the form of a double emulsion but the double-coated film is that which I prefer to employ.

The invention may be applied to the printing of plates or films in black and white, in colour, or suitable for colouring.

Dated this 12th day of May, 1925.

MARKS & CLERK.

## COMPLETE SPECIFICATION.

### Improvements in and relating to the Printing of Cinematograph Films.

I, HERBERT ERNEST COSTON, of 41, Dundonald Road, Brondesbury Park, London, N.W. 10, a British subject, 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 the printing of cinematograph films by printing from two negatives on two film surfaces.

It has for its main object to provide an improved printing machine.

The invention consists in an apparatus for the printing of cinematograph films comprising two lamp houses relatively hinged and having between them a gate through which cinematograph films can be drawn down step by step through the agency of sprockets operated by a Maltese cross mechanism.

The invention also consists in printing machines according to the preceding paragraph and substantially as herein-after described and in films printed in such machines.

Referring to the accompanying diagrammatic drawings:—

Figure 1 represents in part sectional elevation an arrangement for simultaneously printing through two negatives on to opposite sides of a film coated with sensitive emulsion on each side, certain parts being omitted for clearness;

Figure 2 is a detail of the gate mechanism not shown in Figure 1, but drawn to an enlarged scale in comparison with that figure;

Figure 3 is an enlarged view of the Maltese cross mechanism shown in Figure 1, but viewed from the back;

Figure 4 is a section on the line 4—4 of Figure 3 looking in the direction of the arrows;

Figure 5 illustrates parts of a modified form in which the exposures in respect of any given picture are not made simultaneously from both sides of the film to be printed.

In carrying the invention into effect in the form illustrated by way of example in Figures 1 and 2 a cinematograph printing machine for exposing simultaneously a film *a* coated with sensitive emulsion on each side through two negative film bands *b* and *c* is formed with two lamp houses *d* and *e* facing each other. These lamp houses are hinged together but the hinges are not shown in Figure 1.

Hinges which are suitable are indicated below in the description of Figure 5 and are shown in that drawing.

Above the lamp houses *d* and *e* shafts *f*, *g* and *h* are mounted to take three reels *i*, *j* and *k* from which the films *a*, *b* and *c* are unwound. Below the lamp houses shafts *l*, *m* and *n* are mounted for carrying three reels *o*, *p* and *q* on which the films *a*, *b* and *c* are wound. Between the top set of reels and the lamp houses a set of suitably driven sprockets, for example sprockets known as eight-picture sprockets, is placed, this set being indicated by the reference *r*. A similar set of sprockets is situated in proximity to

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the lower set of reels, this set of sprockets being designated *s*. Both sets of sprockets are suitably driven, for example through bevel gearing *t* in respect of the set *r* and *u* in respect of the set *s*, from any convenient drive. Approximately in the centre of the lamp housings apertures *v* and *w* are formed and a suitable gate mechanism *x* is mounted between them. The films in the vicinity of the gate are controlled by the usual film separators and brake, not shown.

A frame *z* is urged by springs 1 in a direction to force the films *a*, *b* and *c* together and against a suitably shaped opening *w* of the lamp housing *e*.

For the purpose of intermittently drawing the films downwards a Maltese cross mechanism is employed.

In the form shown this comprises three sprockets 3 of the kind known as four-picture sprockets, one sprocket acting on each of the films *a*, *b* and *c*, the films being kept in contact with the sprockets by guide wheels 4.

The top sprockets 3 rotate towards one another, so that the films are drawn downwards. They are rotated intermittently through the agency of the Maltese cross 2 which is mounted on the shaft 5 of the lowest of the three sprockets, namely 20.

Referring particularly to Figures 3 and 4, the slots of this Maltese cross 19 are adapted to be entered from time to time by a pin 6 carried on a plate 7 situated between the pinion 20 and a toothed bevel wheel 8 engaging with a driving bevel pinion 9 suitably operated from the mechanism of the machine.

The plate 7 is formed with a central boss 18 with which the curved faces of the Maltese cross 19 contact, a gap 21 being formed in the part 18 to enable the cross to turn whilst the pin 6 is in any of the slots of the Maltese cross.

The cross is practically locked in position by contact of a curved face with the projection 18 on the plate 7 for the time during which the pin 6 travels to the position shown after leaving a slot, which represents the time between its leaving the vertical slot to the time it enters the horizontal slot with the parts in the position shown in Figures 3 and 4.

The pinion 20 which moves with the Maltese cross 19 meshes with an idle pinion 10 which in turn meshes with a pinion 11 on the shaft 12 of one of the sprockets 3, this pinion 11 being formed in one with or connected with the gear wheel 13 which meshes with a similar wheel 14 mounted on the shaft 15 of the other of the top pair of sprockets 3.

In operation as far as this mechanism is concerned, the shaft of the bevel wheel

9 being continuously rotated, the disc 7 is rotated and it is arranged that this is driven in a clockwise direction viewed from the back of the machine as in Figure 3.

The pin 6 thus travels in a clockwise direction and from the position shown in Figure 3 it enters the horizontal slot of the Maltese cross 2 so that on continuous motion of the pin the cross is rotated in a counter-clockwise direction.

Continuous rotation of the disc 7 therefore gives intermittent movement to the cross 2.

When the cross 2 rotates in a counter-clockwise direction the idle pinion 10 is in turn in a clockwise direction, the pinion 11 and gear wheel 13 are rotated in a counter-clockwise direction and the pinion 14 in a clockwise direction.

As the lowest sprocket namely 10 is mounted on the same shaft as the Maltese cross the effect of the movement is intermittently and simultaneously to draw downwards the three films *a*, *b* and *c*, notwithstanding the continuous rotation of the sprockets *s*.

Returning now to the lamp housings *d* and *e*, in each of these a suitable lamp 16 and 17 respectively is mounted, each lamp preferably being adjustable in position towards and away from the adjacent film. In addition preferably each lamp is provided with an adjustable resistance or the like for varying the intensities of the light and this may be automatically controlled, for example, by notches or the like previously formed on the edges of the films so that stronger illumination is provided at parts of comparatively high density. Between the lamps and the films appropriate rotating shutters are mounted, these being synchronised, for example, by clutching together with a dog clutch, the drive being effected in any convenient way.

In operation the three films *a*, *b* and *c* are drawn downwards together by means of the Maltese cross mechanism 2 acting in conjunction with the loops formed in the films by the action of the sprockets *r* and *s*. Owing to the action of the lamps 16 and 17 and to the shutter mechanism the middle film *a* is simultaneously printed from both sides through the two film bands *b* and *c* one on each side of it.

According to the modification shown in Figure 5, in place of the simultaneous printing the film *a* is printed alternately from different sides. To enable this to be effected the opening *v* in the lamp *d* is placed out of line with the opening *w* in the lamp *e*, the difference being equal to the length of one, two or more pictures.

The two lamp housings *d* and *e* are

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hinged together by pairs of curved brackets 22 and 23, one pair being mounted on each housing, a suitable shaft 24 connecting these brackets so that the lamp housing *d* can readily be swung away from the lamp housing *e* and readily returned into position.

The lamp housings may be independently pivoted if desired by employing two pivots instead of a common pivot such as 24 shown in Figure 5.

In place of using a film with emulsion on both sides for the film on which the print is to be obtained a film with emulsion on only one side may be used, the two surfaces of that emulsion acting as the two outer surfaces of the double-coated film. Such emulsion may be specially prepared for this purpose and may take the form of a double emulsion but the double-coated film is that which I prefer to employ.

In place of printing a positive through two negatives, a negative may be printed through positives or a positive through two positives or a negative through two negatives by means of a suitable process.

The invention may be applied to the

printing of films in black and white or in colour, or suitable for colouring.

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 photographic printing machine for printing cinematograph films comprising two lamp houses facing each other and adapted to effect simultaneous or alternate printing from opposite sides through negative or positive films, the two lamp houses being relatively hinged and there being a gate between them through which cinematograph films can be drawn down through the agency of sprockets operated by a Maltese cross mechanism.

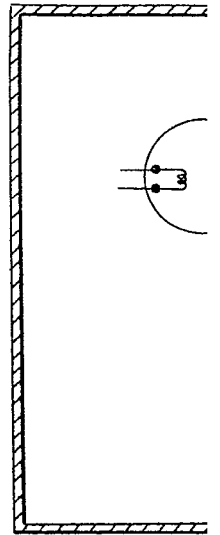
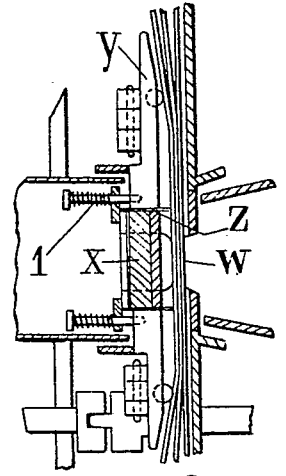
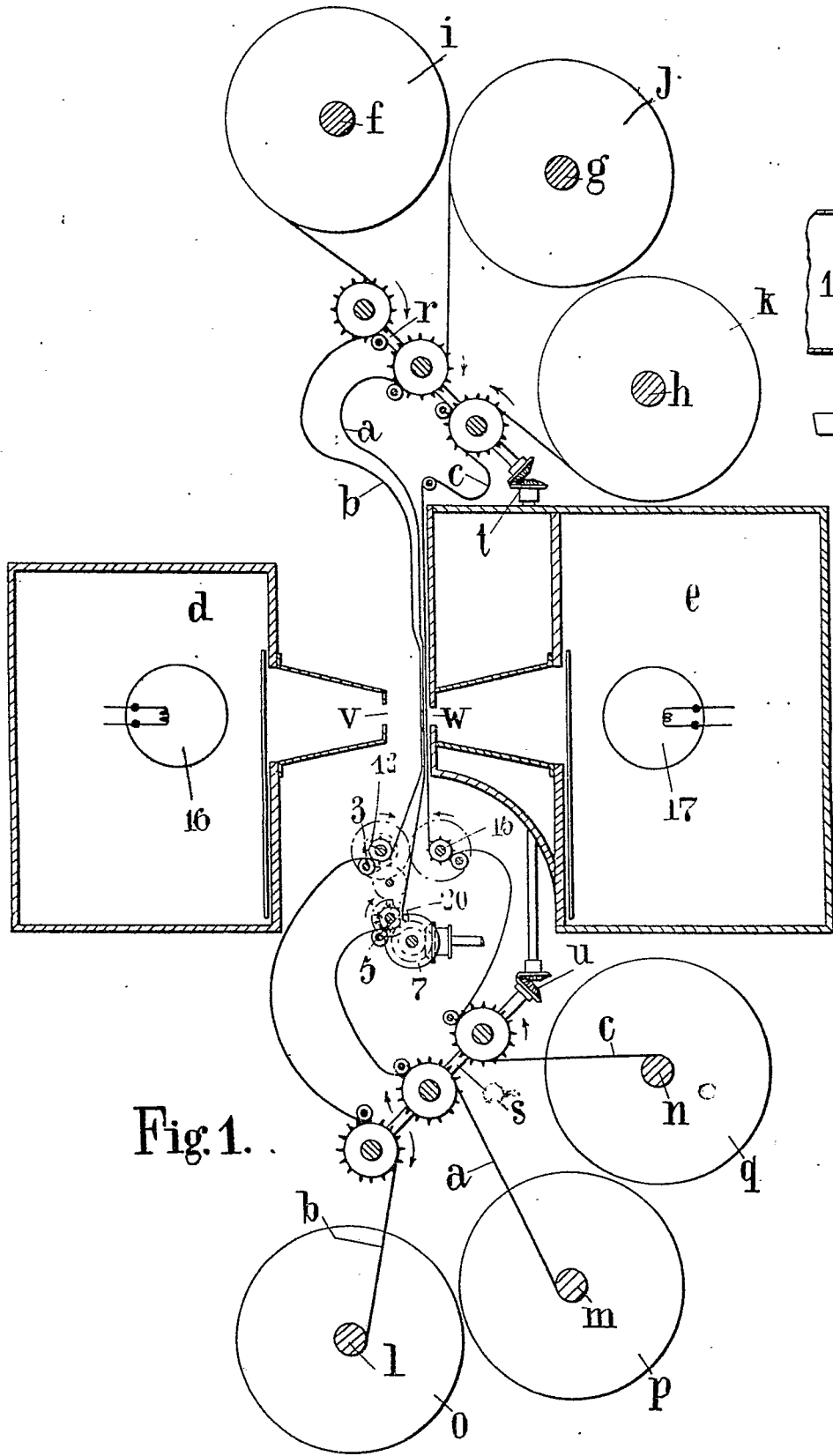
2. Printing machines for cinematograph films substantially as herein described.

3. Films or plates printed in an apparatus substantially as herein described.

Dated this 12th day of February, 1926.

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



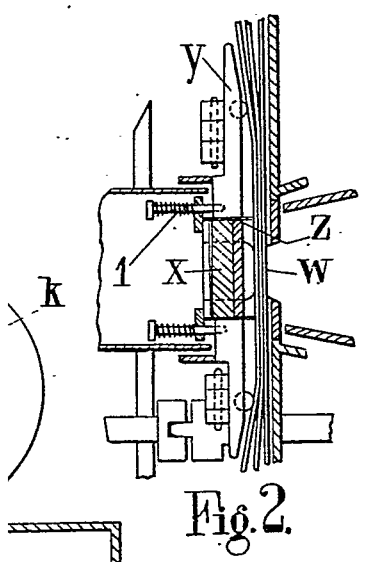


Fig. 2.

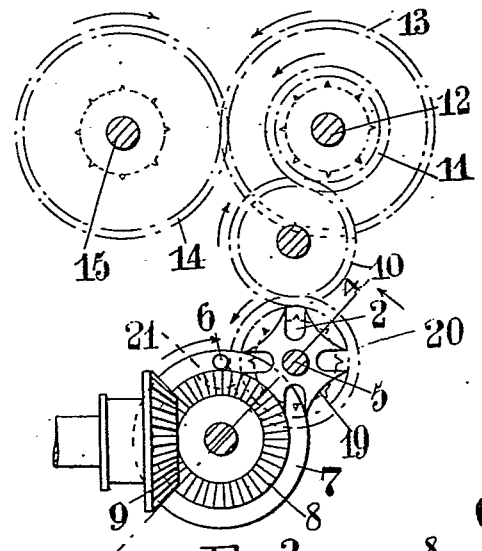


Fig. 3.

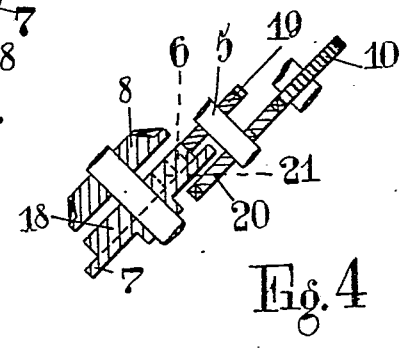


Fig. 4.

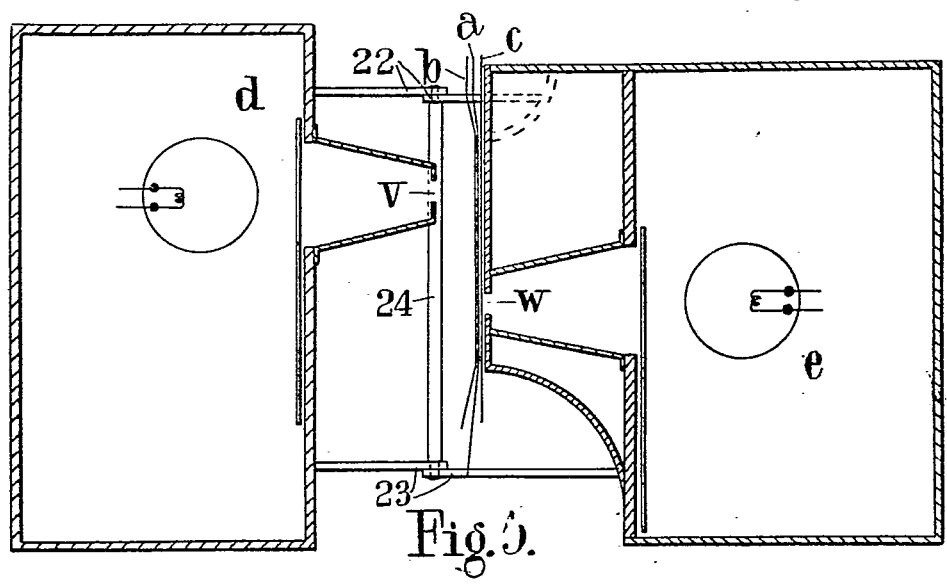
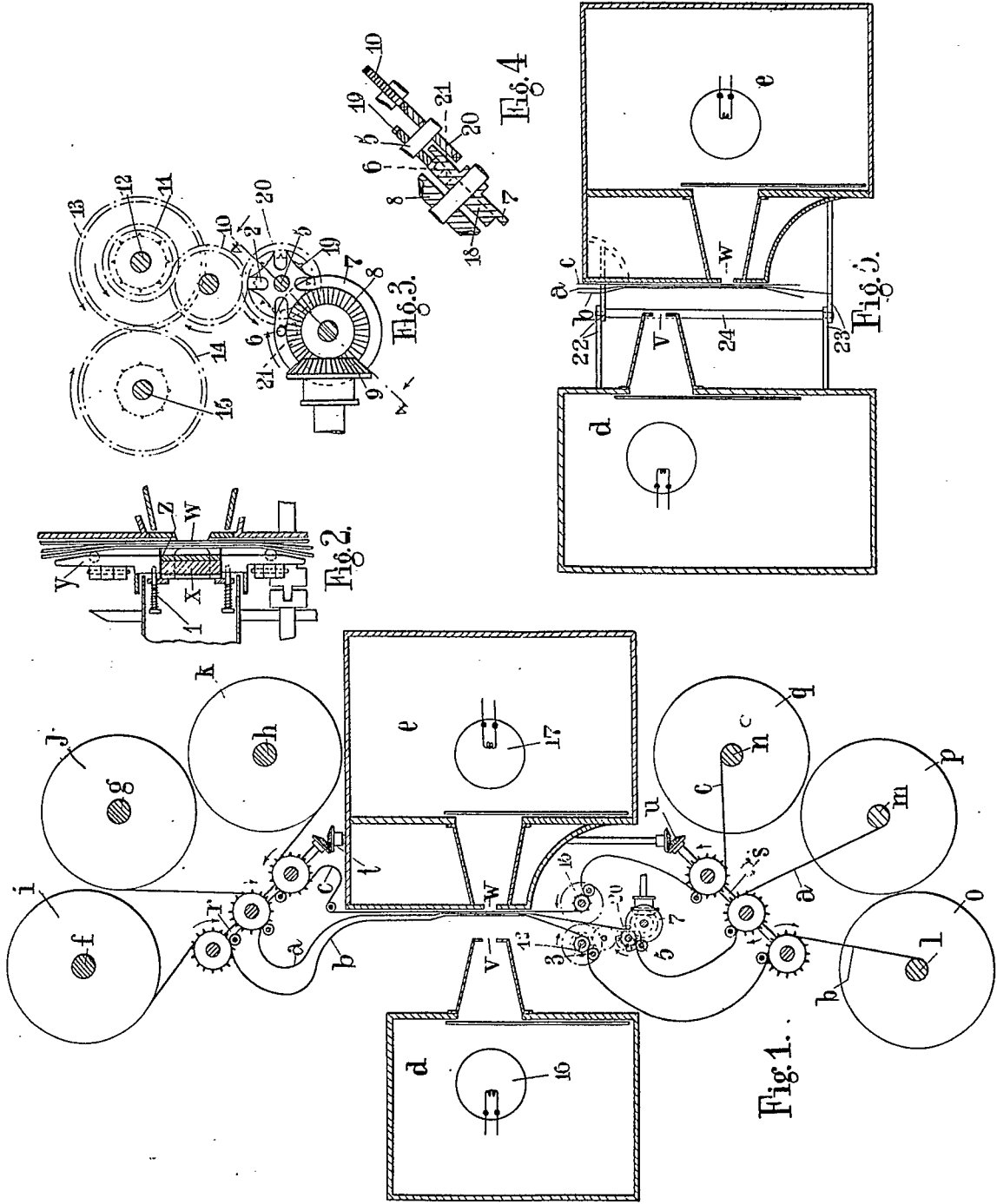


Fig. 5.



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