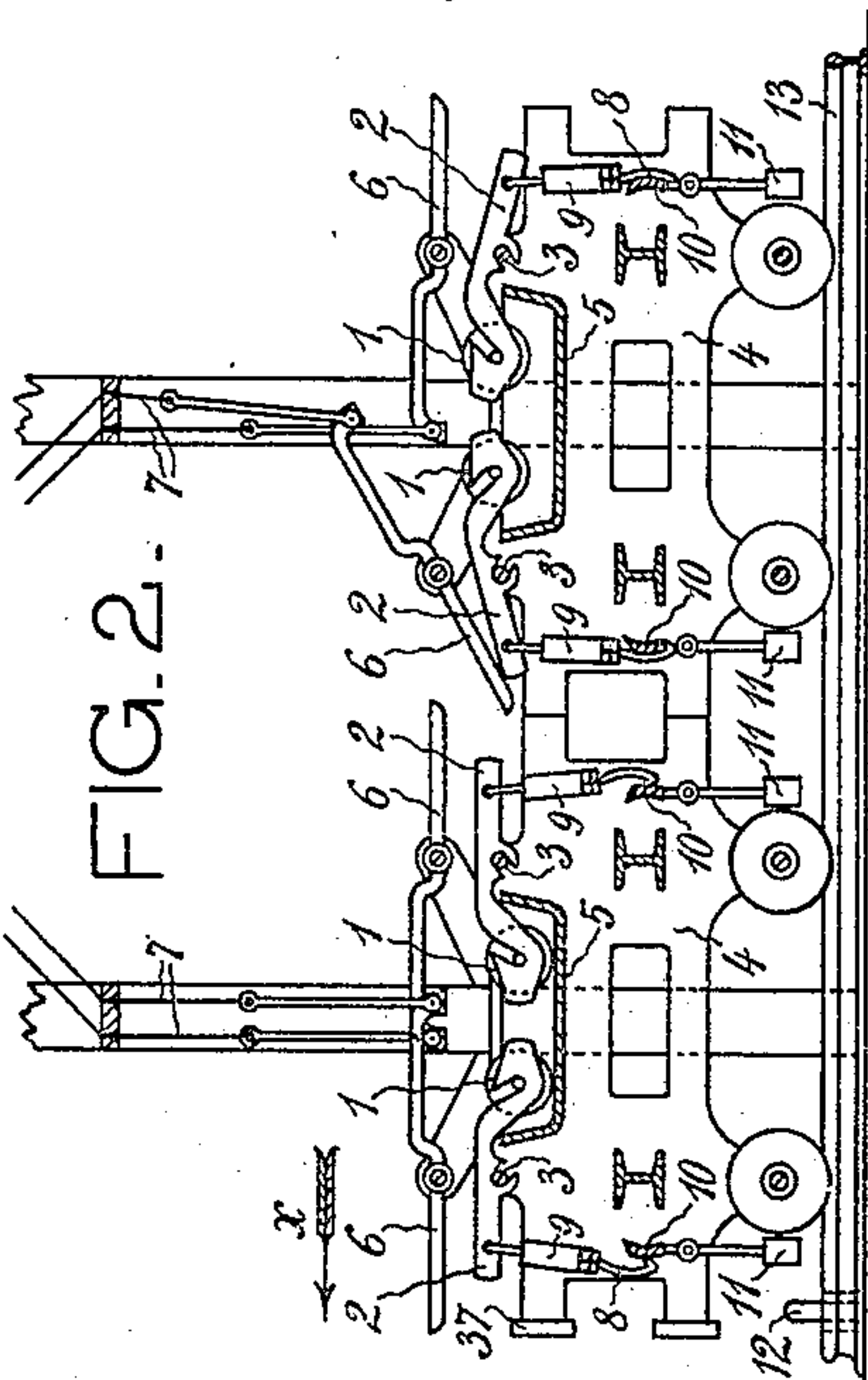
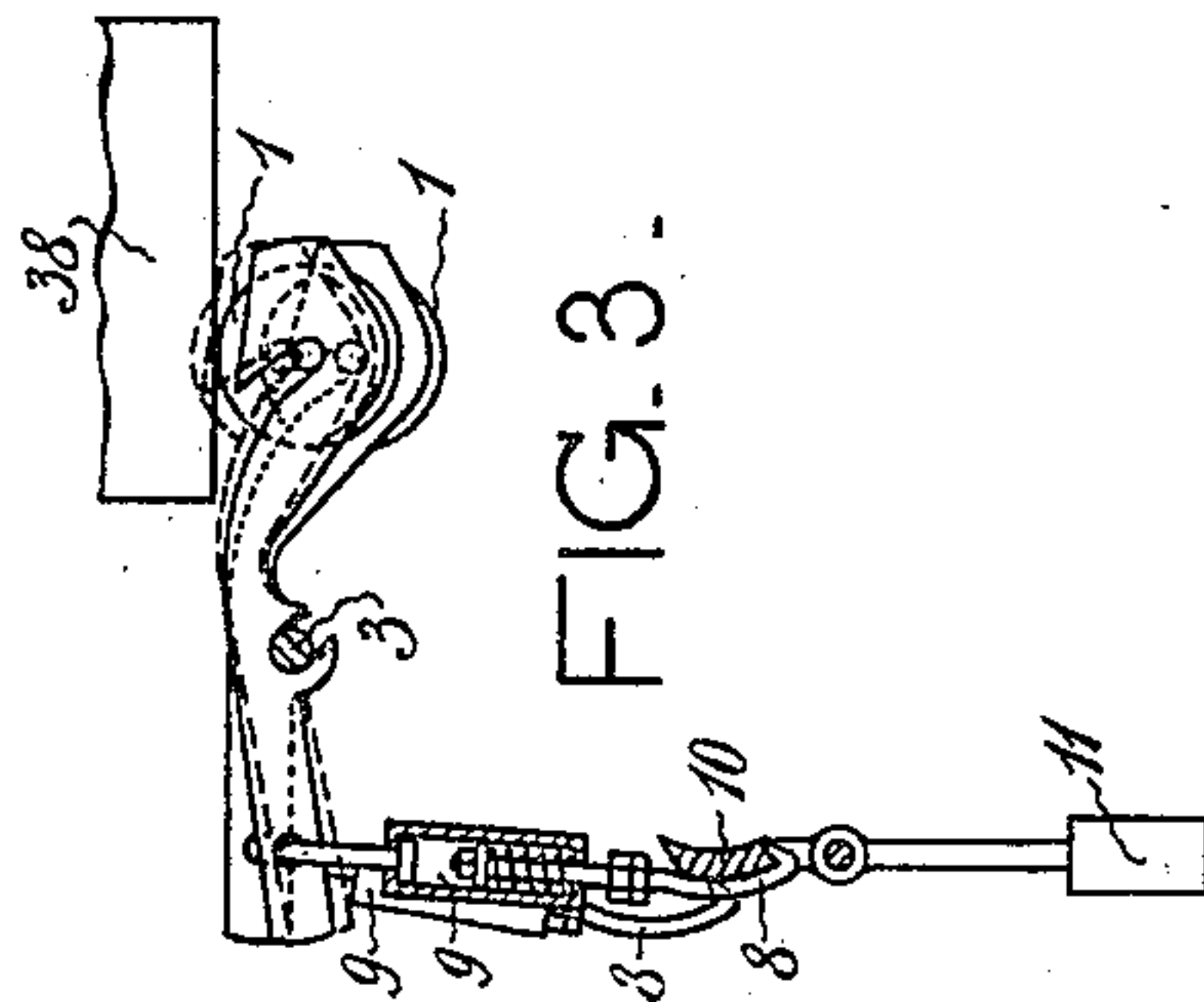
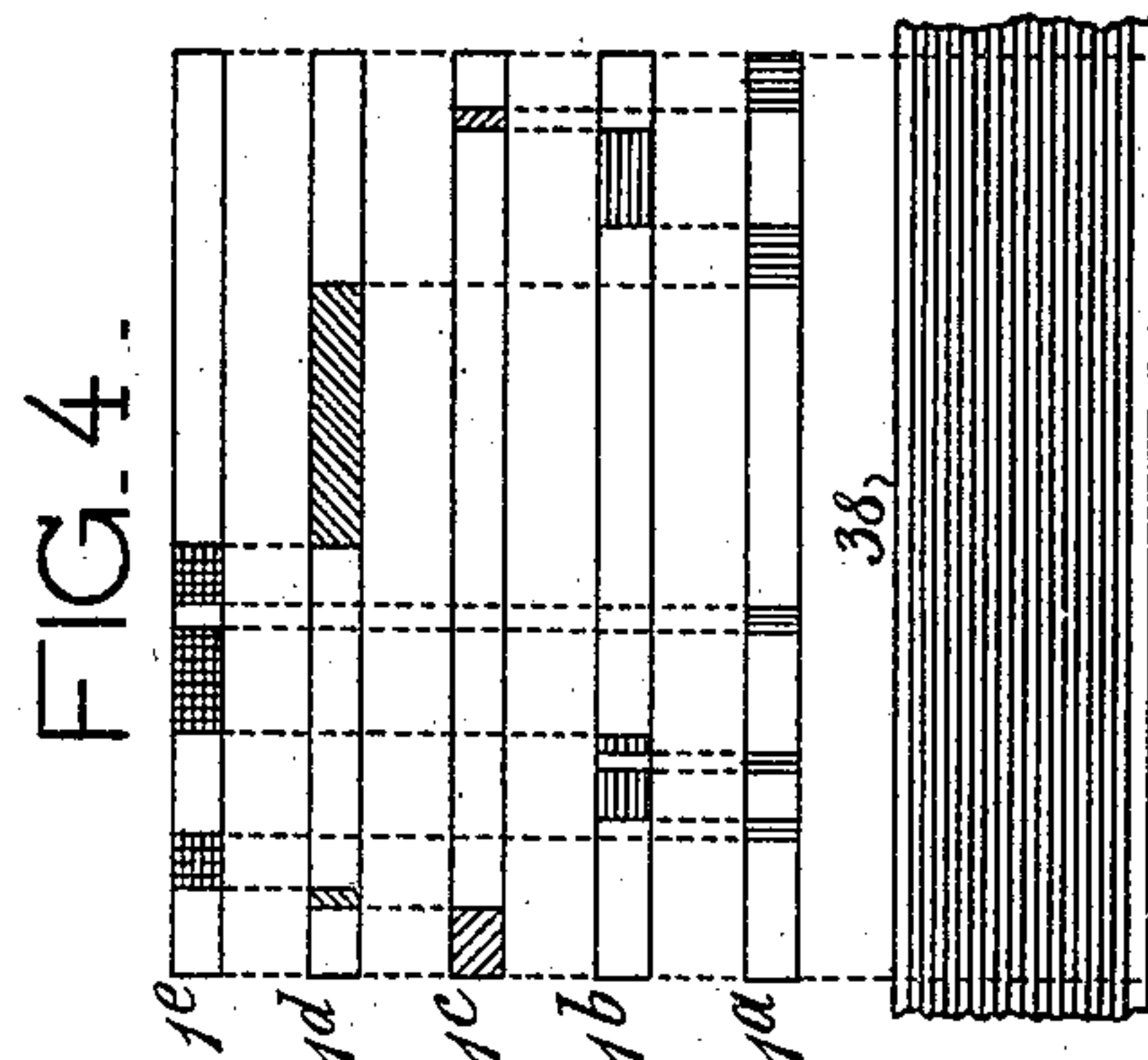
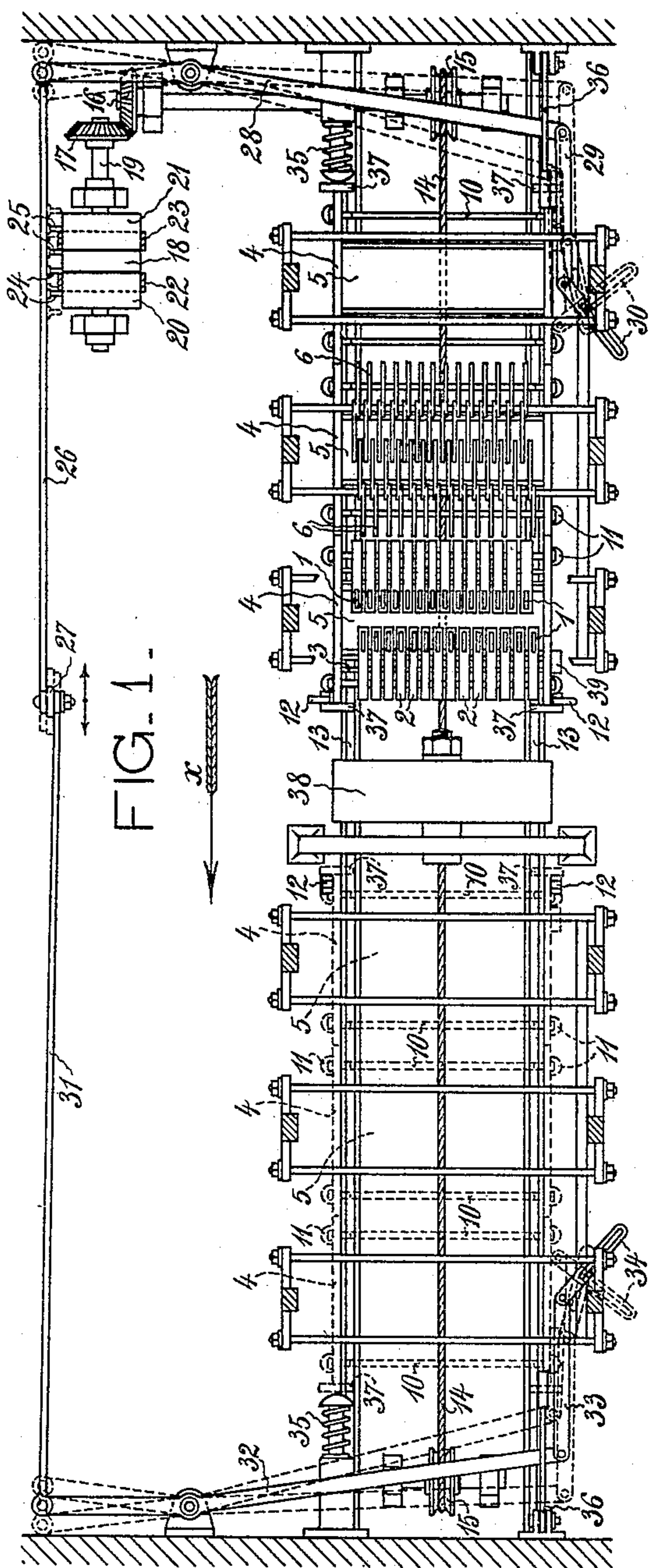


No. 816,796.

PATENTED APR. 3, 1906.

A. HOFMANN.  
APPARATUS FOR PRINTING YARNS.

APPLICATION FILED JULY 6, 1904.



WITNESSES  
A. W. White  
John A. Percival.

INVENTOR  
Alfred Hofmann  
By *[Signature]*  
ATTORNEYS



# UNITED STATES PATENT OFFICE.

ALFRED HOFMANN, OF GOTHENBURG, SWEDEN.

## APPARATUS FOR PRINTING YARNS.

No. 816,796.

Specification of Letters Patent.

Patented April 3, 1906.

Application filed July 6, 1904. Serial No. 215,558.

*To all whom it may concern:*

Be it known that I, ALFRED HOFMANN, a subject of the King of Saxony, residing at 5 Södra Allégatan, Gothenburg, in the Kingdom of Sweden, have invented new and useful Improvements in and Relating to Apparatus for Printing Yarns, of which the following is a specification.

My invention relates to apparatus for printing yarns.

For printing the yarn it is stretched in the form of a band of threads placed side by side. A certain length of this band is then printed with the desired transverse stripes, whereupon the band is moved on a distance corresponding to the said length, and so on.

Formerly it was customary to print upon a certain length of the band first the stripes of the same color one after the other by means of the same printing device, which after producing a stripe was moved along the yarn to the position where the next stripe of the same color was to be printed. When in this way all the stripes of the same color had been printed upon the surface, the stripes of a second color were printed in like manner. This operation was continued until the entire surface was printed with the desired design. Subsequently the method was improved, the several stripes of different colors being printed at the same time, and the several stripes of different colors being then produced on another portion of the band, and so on till the entire surface was printed with the desired design. The apparatus employed for this purpose consisted of carriages adapted to be moved step by step along the yarn and carrying printing-rollers. Those rollers which were to come into operation on the stoppage of the carriage in the required position were automatically released and through the medium of a suitable device were moved transversely over the yarn—that is to say, transversely to the direction of movement of the printing-carriage.

The apparatus constructed according to my said invention, and which is designed to simplify and shorten the work of printing, is particularly adapted to be used for printing warp-yarns and differs from the well-known apparatus by printing simultaneously first all the stripes of one color, then simultane-

ously all the stripes of a second color, then those of a third color, &c., until the whole surface has been printed with the desired design.

In the improved apparatus the printing devices are arranged in series one behind the other and move at right angles to the longitudinal direction of the stretched yarn. Each series serves for printing one color. Those of the printing devices of each series which are to produce a stripe in the respective movement of the printing devices over the yarn are placed in the operative position, either by hand or automatically by means of a dobby, Jacquard machine, or other suitable device. In order to enable the printing devices of a series which are in readiness for the operation to work simultaneously and the several series to work in quick succession, the die troughs or tanks containing the printing devices are held in carriages, which after the printing devices have been placed in position are moved automatically under the yarn carrier or support furnished with plane printing-surfaces. In this manner each series of the printing devices produces certain stripes in one displacement of the carriage and each following series prints upon unprinted portions, so that it is feasible to print the whole surface with designs by a single displacement of the carriage which takes place transversely to the direction of the stretched yarn, while in the apparatus hitherto used only a few stripes were produced upon the surface to be printed after each step movement of the carriage taking place in the longitudinal direction of the yarn.

The printing devices employed are preferably rolls arranged in such a manner that they are held in the position of rest by their own weight, while after having once been placed in the operative position they are caught up by a locking device adapted to be automatically released after the termination of the printing, and are thereby kept in readiness for work.

In the accompanying drawings I have represented, by way of example, a constructional form of my said invention.

Figure 1 is a general plan of this apparatus. Fig. 2 is a longitudinal section of the printing-carriage. Fig. 3 is a diagram showing the device for actuating the printing-rollers.



Fig. 4 is a diagram showing a position of the printing-rollers arranged in series and placed in the operative position.

The rollers 1, which serve as printing devices, are carried by levers 2, which can oscillate on centers or axes 3, Figs. 2 and 3. The printing-rollers 1 are held by their own weight in their position of rest, in which the levers 2 bear freely on the edge of the dye troughs or tanks 5, which are arranged on the carriage 4, the said printing-rollers being then near the bottom of the tanks 5. In order to obtain as compact a form of contruction as possible, two rows of printing-rollers are arranged in each dye-tank, the rollers of one row alternating with those of the other row. The free ends of the levers 2 are situated in the path of cams or strikers 6, which by means of the cords 7 of a Jacquard machine (not represented) or by any suitable equivalent means may be so turned on their centers that in their operative movement they will force one end of the roller-carriers 2 downward, and thus bring the rollers 1 into position ready for operating. Each lever 2 carries at its free end a hook 8, which is provided with a spring safety arrangement 9. By the downward pressure of the lever 2 the corresponding hook 8 is caused to catch under a cross-bar 10, which can tilt round its longitudinal axis, the said cross-bar by means of a counterweight 11, rigidly attached to it, being held in working position and being adapted to be released by a stop 12 cooperating with the said counterweight.

The carriages 4 can be moved on rails 13 by a rope 14, which is operated by means of the pulley 15, beveled toothed wheels 16 17, and a belt-pulley 18, which is fixed upon the shaft 19. Upon each side of the belt-pulley 18 is a pulley 20 21, running loose upon the shaft 19. The rotation of the fixed belt-pulley 18 can be effected by means of two belts 22 23, which are arranged to run in opposite directions, and by the belt-shifting forks 24 25 can be shifted alternately from the loose pulleys 20 or 21 to the fast pulley 18.

By the shifting of the belt 22 on the fast pulley 18 the rotation takes place in one direction, while by shifting the belt 23 onto this pulley the rotation takes place in the opposite direction. The shifting of the belt-forks 24 25 is effected by a draw-rod 26, connected with a hand-lever 27. To the other end of the draw-rod 26 a bent lever 28 is jointed, which by means of a link 29 is connected with a movable stop 30, situated in the path of the carriage 4.

Connected with the hand-lever 27 is a rod 31, which by means of a lever 32 and link 33 is attached to a lever 34, which is arranged similarly to the stop 30, but conversely and at the opposite end of the path of the carriage 4. When the apparatus is at rest, the

belts 22 23 run on the loose pulleys 20 21, and the parts 26 to 34 are in the position shown in full lines in Fig. 1. The driving device is set in operation by turning the hand-lever 27 to the right or left, causing the parts 26 to 34 to take one of the positions shown in dotted lines. The stops 30 34 serve to automatically throw the driving device out of gear on the carriages arriving at one end of their travel. In order to bring the carriages gradually to rest, buffers 35 are provided at each end of their path, while the carriage 4 is at the same time caught by hooks 36, engaging with projections 37 on the carriage 4, and adapted to be released by the lever-gear 26 to 34. In the middle of the path of travel of the carriage 4 is arranged a yarn-carrier 38 of any suitable kind provided with a plane printing-surface.

When the apparatus is at rest, the carriages 4 are in the position shown on the right-hand side of Fig. 1, all the roller-carriers 2 occupying at first the position shown on the left of Fig. 2. By means of the pattern-card of a Jacquard machine such of the strikers 6 are brought into operation as correspond with the design to be printed. By the pulling of a cord 7 the respective striker 6 is brought down, as shown in the case of one of the strikers in the right-hand part of Fig. 2. The striker 6 presses the corresponding roller-carrier 2 down, and the hook 8, connected with the latter, is caught up by the cross-bar 10, so that the roller-carrier 2 after having been adjusted is automatically held in the position corresponding to the readiness of the printing-roller 1 to operate. The whole of the printing-rollers necessary for the production of the design having been brought into proper position ready for operation, the hand-lever 27 is turned to the left, so that the belt 23 is placed on the driving-pulley 18, thereby operating the driving device so as to move the carriage 4 in the direction of the arrow *x*, Figs. 1 and 2. During the movement of the carriage 4 the printing-rollers are brought under the yarn-carriers 38, so that the printing-rollers kept in readiness for operation move against the printing-surface, Fig. 3.

In the diagram Fig. 4 I have shown, by way of example, five series of printing-rollers  $1^a 1^b 1^c 1^d 1^e$ , each series of rollers being designed for printing one particular color upon the series of threads passing over the surface of the yarn-carrier 38. Those rollers of the several series  $1^a 1^b 1^c 1^d 1^e$  which are placed in their operative position and in one displacement of the printing-carriage 4 print stripes across the series of threads forming the printing-surface are indicated in the diagram by sectional shading, the rollers of the first series  $1^a$  printing, for instance, five red stripes, those of the second series  $1^b$  printing three



blue stripes, those of the third series 1<sup>c</sup> printing two green stripes, those of the fourth series 1<sup>d</sup> printing two purple stripes, and those of the fifth series printing three black stripes, as will be readily understood.

The arrangement is such that in order to produce sharp designs the printing-rollers during the printing will be pressed a little down against the action of the springs 9, so that they pass from the highest position (indicated in dotted lines in Fig. 3) to the working position. (Shown in full lines.) In the further movement of the carriage 4 the weights 11 come against the stop 12, raised to the operative position. By this means the corresponding cross-bar 10 is tilted over, so that it releases the hooks 8, caught up by the same, the respective printing-rollers 1 being thus allowed to return to their original position by their own weight. Immediately before the carriages reach the end of their travel a projection 39 on the outer side of the foremost carriage comes in contact with the stop 34 of the shifting-gear 33 32, thereby shifting the belt 23 back to the loose pulley 21 and throwing the driving device out of gear. The carriages run on by their momentum until they are brought to a stand by the buffers 35 and the hooks 36. A fresh adjustment of the printing-rollers can then be effected by means of the Jacquard machine, whereupon the following printing-surface is brought into its operative position, and by moving the hand-lever 27 to the right the driving device for effecting the movement in the opposite direction to that of the arrow *x* is thrown into gear and the action of the several operative parts takes place in the manner already set forth.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In apparatus of the character described, the combination, with a carrier for supporting a series of threads to be printed, of a carriage, means for displacing this carriage in the transverse direction of the said threads, printing members designed for printing different colors and placed upon the said carriage in several successive rows extending parallel to the threads, and means for causing one or more printing members in each row to simultaneously print the same color in the displacement of the said carriage across the threads, substantially as and for the purpose herein set forth.

2. In apparatus of the character described, the combination, with a carrier for supporting a series of threads to be printed, of a carriage, means for displacing this carriage in the transverse direction of the said threads, printing members designed for printing different colors and placed upon the said carriage in several successive rows extending parallel to the threads, the printing members of one row

alternating with those of the next row, and means for causing one or more printing members in each row to simultaneously print the same color in the displacement of the said carriage across the threads, substantially as and for the purpose herein set forth.

3. In apparatus of the character described, the combination, with a carrier for supporting a series of threads to be printed, of a carriage, means for displacing this carriage in the transverse direction of the said threads, printing members designed for printing different colors and placed upon the said carriage in several successive rows extending parallel to the threads, selective means for operating the printing members in each row independently of each other for simultaneously printing one or more stripes of the same color in the displacement of the said carriage across the threads, substantially as and for the purpose herein set forth.

4. In apparatus of the character described, the combination, with a carrier for supporting a series of threads to be printed, of a carriage, means for displacing this carriage in the transverse direction of the said threads, dye-tanks located on the said carriage, printing members placed in these tanks in several successive rows extending parallel to the threads, and selective means for raising the printing members in each row from the said dye-tanks to their operative position for simultaneously printing one or more stripes of the same color in the displacement of the said carriage across the threads, substantially as and for the purpose herein set forth.

5. In apparatus of the character described, the combination, with a carrier for supporting a series of threads to be printed, a carriage, means for displacing this carriage in the transverse direction of the said threads, printing members placed upon the said carriage, levers for supporting these members, means for depressing the levers separately, and means for holding the said members in their operative position, substantially as and for the purpose herein set forth.

6. In apparatus of the character described, the combination, with a carrier for supporting a series of threads to be printed, a carriage, means for displacing this carriage in the transverse direction of the said threads, printing members placed upon the said carriage, levers for supporting these members, means for depressing the levers separately, locking-hooks, a spring connection between the said locking-hooks and levers, transverse tilting bars adapted to engage with the locking-hooks, balance-weights attached to the tilting bars, and a stop, substantially as and for the purpose herein set forth.

7. In apparatus of the character described, the combination, with a carrier for supporting a series of threads to be printed, a car-

riage, means for displacing this carriage in  
the transverse direction of the said threads,  
printing members placed upon the said car-  
riage, levers for supporting these members,  
5 strikers arranged to act upon the said levers,  
and means for controlling separately each of  
the strikers, substantially as and for the pur-  
pose herein set forth.

In testimony whereof I have signed my  
name to this specification in the presence of 10  
two subscribing witnesses.

ALFRED HOFMANN.

Witnesses:

E. JOHNSON,

AXEL RUBENSEN.