No. 787,081. PATENTED APR. 11, 1905.

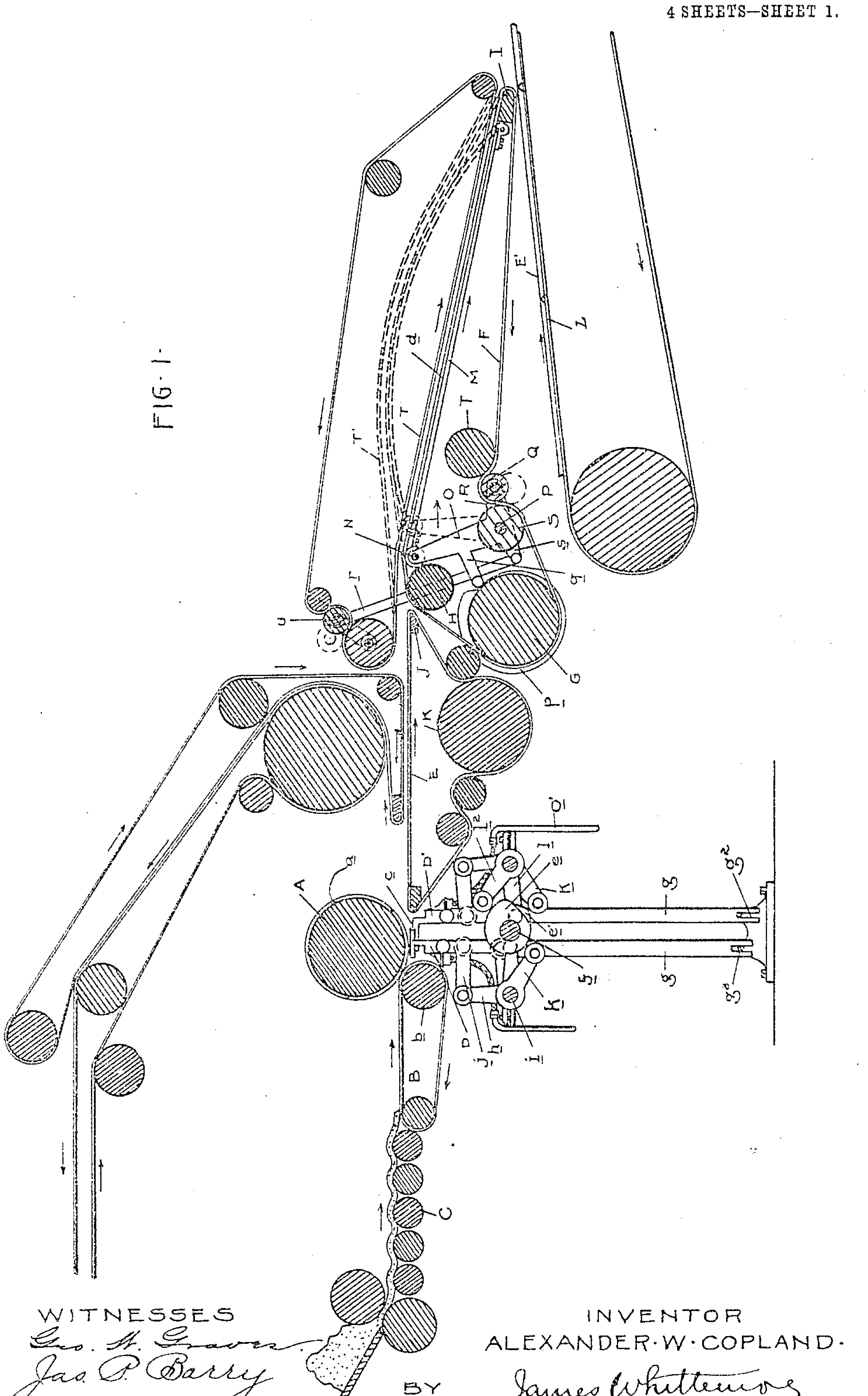
A. W. COPLAND.

DOUGH FEEDING MECHANISM.

APPLICATION FILED JAN. 26, 1904.

4 SHEETS—SHEET 1.

FIG. 1.



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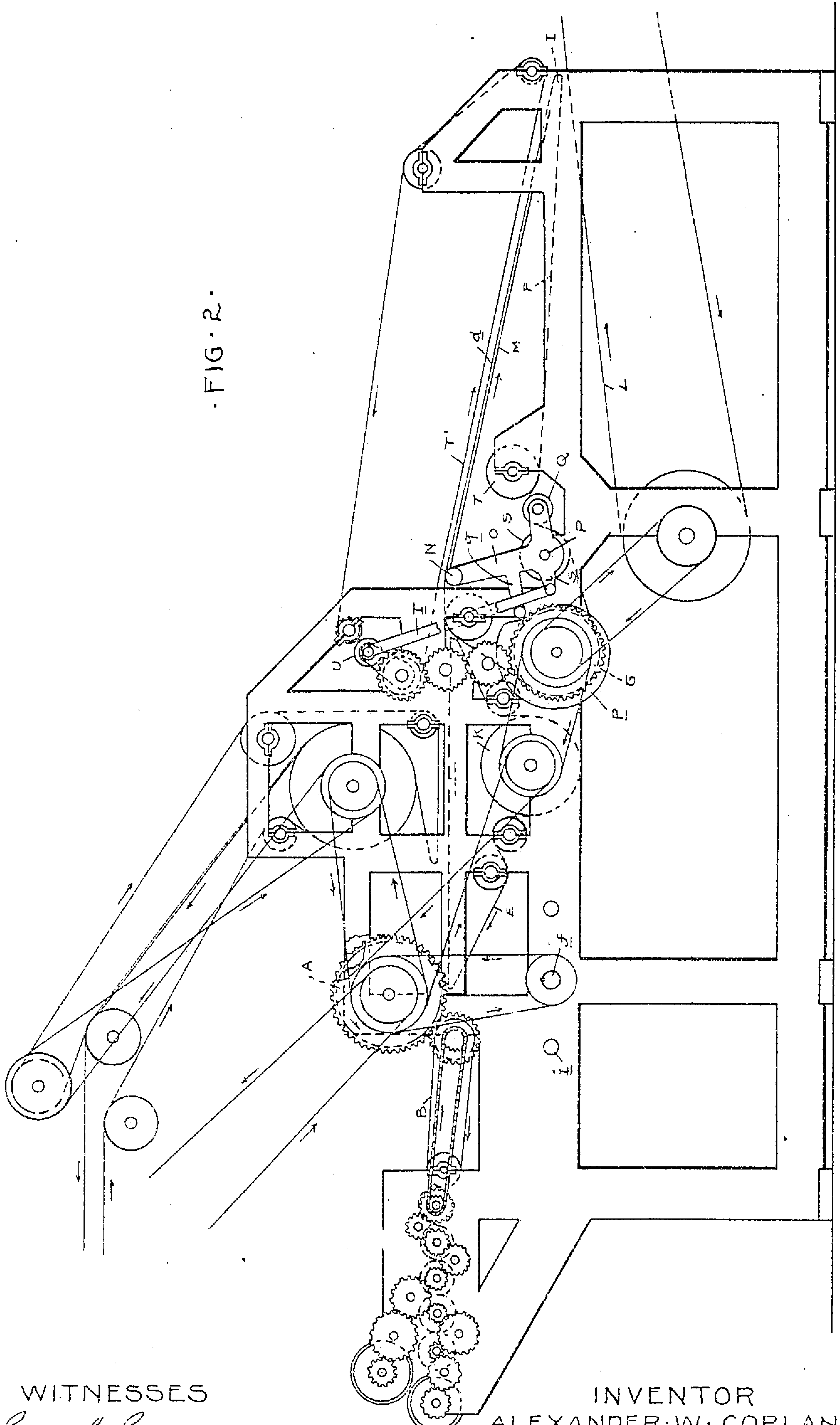
4 SHEETS—SHEET 2.

FIG. 2.



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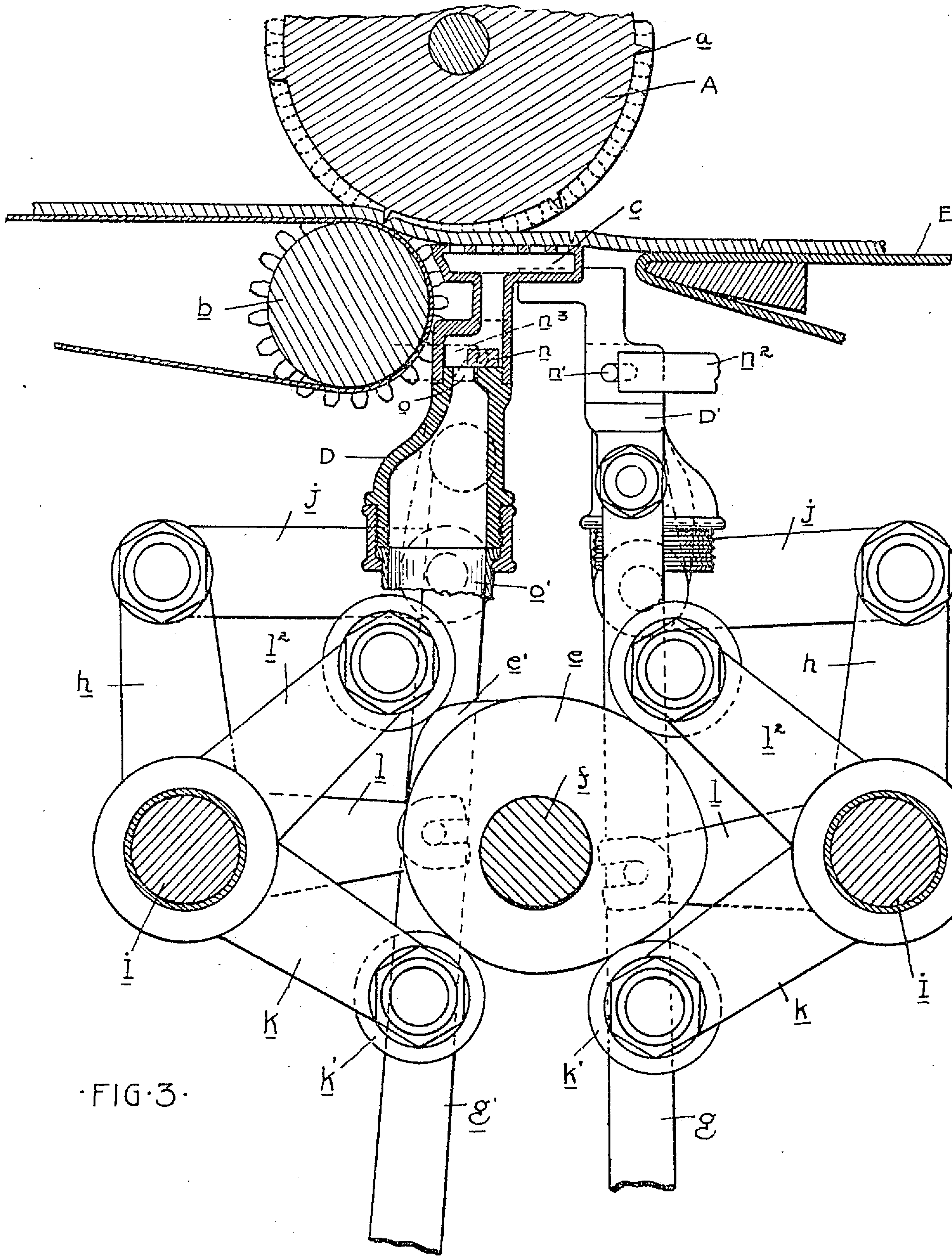
4 SHEETS—SHEET 3.



·FIG·3·

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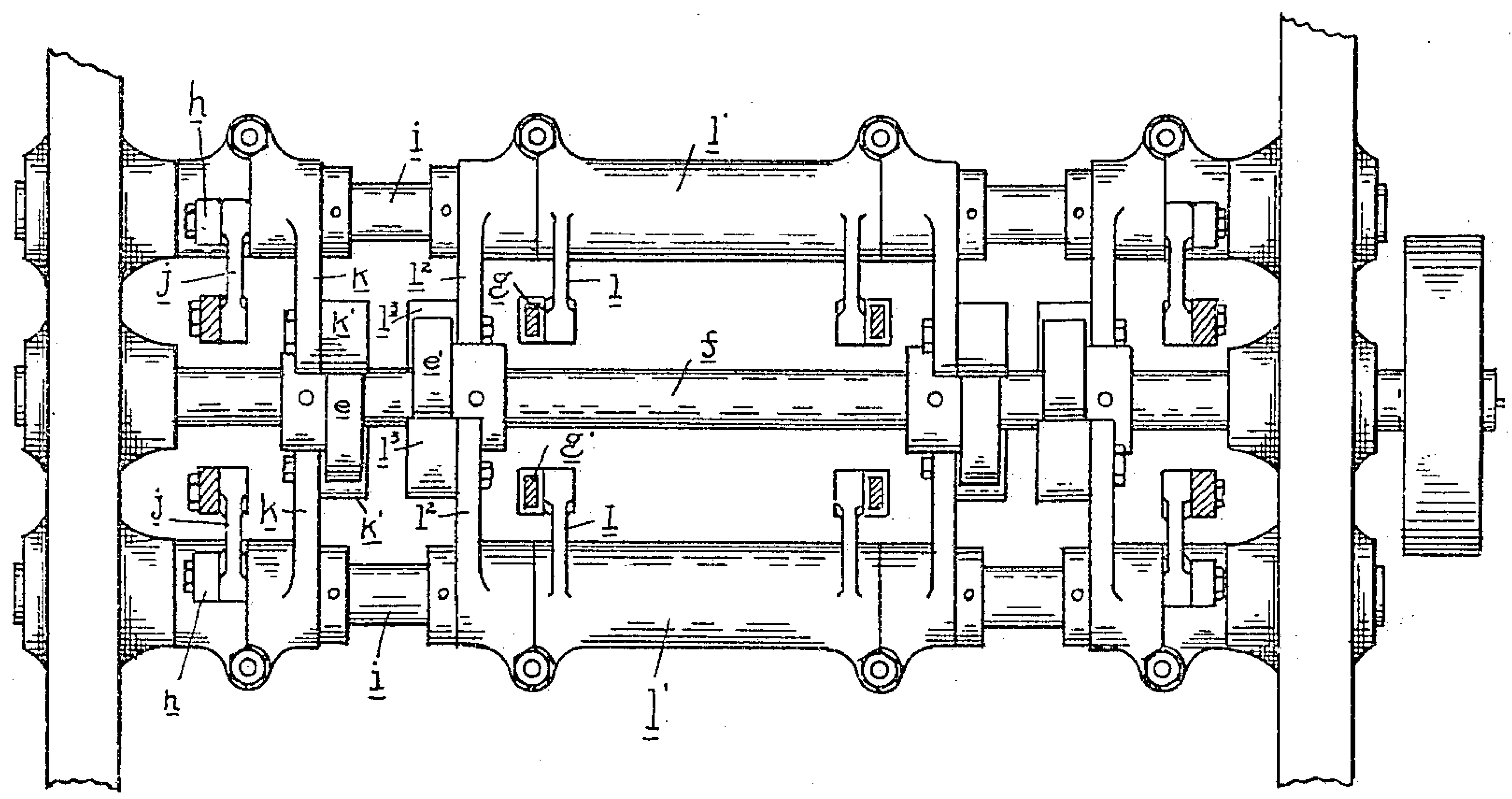
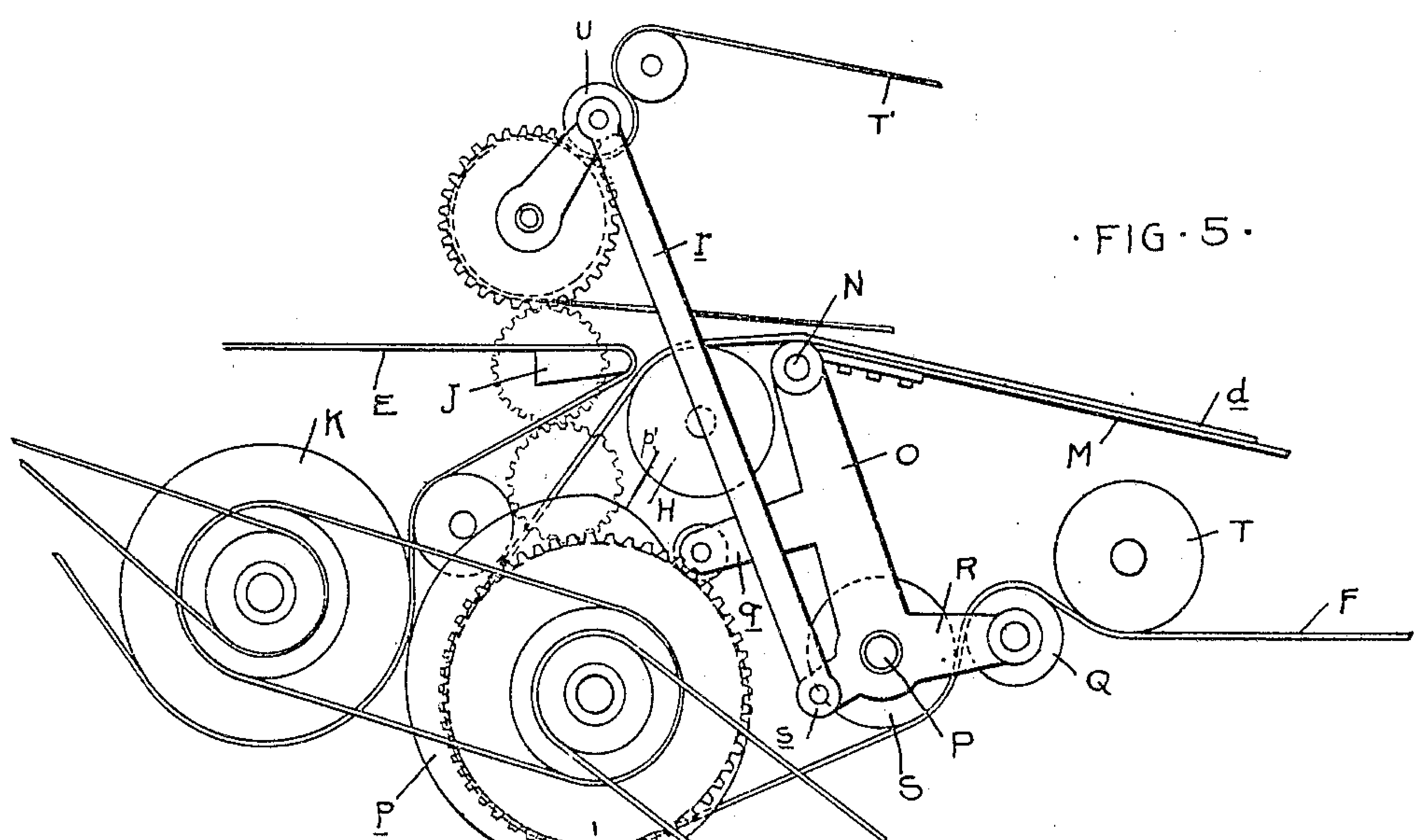


·FIG·4·



·FIG·5·

WITNESSES

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No. 787,081. Patented April 11, 1905.

UNITED STATES PATENT OFFICE.

ALEXANDER W. COPLAND, OF DETROIT, MICHIGAN.

DOUGH-FEEDING MECHANISM.

SPECIFICATION forming part of Letters Patent No. 787,081, dated April 11, 1905.

Application filed January 26, 1904. Serial No. 190,723.

To all whom it may concern:

Be it known that I, ALEXANDER W. COPLAND, a citizen of the United States, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Dough-Feeding Mechanism, of which the following is a specification, reference being had therein to the accompanying drawings.

The invention relates to a feeding mechanism, and I have herein illustrated my invention as applied to and combined with a cracker rolling and cutting machine, although in its broader features my invention may have other uses.

The invention consists in a feed device in which the material thereon may be received in a constant web or stream and be delivered intermittently, or vice versa, or in which the feed and the discharge may be varied; further, in the construction of the dough-feed from the roller, whereby the dough is "tucked" or compacted; further, in the feed devices at the cutter, and, further, in the construction, arrangement, and combination of the various parts, as more fully hereinafter described, and particularly pointed out in the claims.

In the drawings, Figure 1 is a vertical longitudinal section through the feeding mechanism. Fig. 2 is an elevation thereof. Fig. 3 is an enlarged view of a portion of the mechanism shown in Fig. 1, illustrating in elevation the raising and lowering of the feeders. Fig. 4 is a plan of a portion of Fig. 3. Fig. 5 is an elevation showing the cam and connecting mechanism controlling the variable feed.

A is the cutter, which, as shown, is of cylindrical form and is provided with sharpened ribs or flanges *a*, outlining the cutting-spaces. The sheet-dough is fed to the cutter A from a suitable carrier, such as B, which receives it from the sheeting mechanism. The dough mass when rolled in sheet form has a certain amount of resiliency, which imparts to the sheet a tendency to contract. Thus if the sheet were directly fed to the cutter the severing of the same by the ribs *a* would relieve the tension, with the result that the individual sections would contract, thereby altering in shape. In my present construction I have avoided this difficulty by interposing between the rolling mechanism and the cutter a differentially-speeded carrier, the arrangement being such that as the dough is fed along the speed of its forward portion is slightly less than that of the following portion, which permits a contraction in the dough. This differential carrier in the construction shown comprises a series of differentially-speeded adjacent rolls C, which are geared or otherwise driven to progressively diminish in speed to the required degree.

The precise construction of the cutter A is not material to the present invention; but, as shown, it is arranged adjacent to the roll *b*, over which the apron of the carrier B passes, said roll forming the abutment against which the dough is cut. Adjacent to the roll *b* is arranged a stripping mechanism which serves to strip or separate the cut dough from the cutter and feed it to the delivering-carrier. This stripping device comprises, essentially, a reciprocating feeder provided with suction means for causing the dough to adhere thereto during the forward movement and a cut-off for releasing the suction during the return movement. A constant feeding operation is obtained by providing two alternately-reciprocating feeders, which are provided with interspersed suction-bearings so arranged that one series will support and feed the dough during the return movement of the other series. Thus the dough fed around the cutter A from the carrier comes in contact with one or the other of the reciprocating feeders D and D'. The suction which is produced within the chamber in said feeder and is communicated to the hollow suction-support *c* thereof will cause the dough to firmly adhere to the feeder and will maintain it in contact therewith until the cutting-ribs have been drawn away. This is caused by the rotation of the cutter, and inasmuch as the forward movement of the feeder is the same in speed as the rotation of the cutter the cut dough is removed without distortion. As soon as one of the feeders has reached the limit of its forward movement the suction is relieved, and the second feeder, which in the meantime has been returned and engaged with the dough, is ready to feed forward. The dough after passing beyond the feeders D and D′ is preferably fed upon a traveling apron, such as E. The speed of this apron is preferably the same as that of the cutter and feeders D and D′, and inasmuch as the cutter is continuous in its operation a continuous series of cut sections will be fed on the apron E. If these sections are to be placed on pans, it is necessary to provide means for spacing or dividing between adjacent sections of the cut dough which are to go in different pans, so as to prevent feeding on the edges of and between pans. This might be accomplished by a periodic accelerated forward movement or "skip" of the pans E′; but such a sudden change in the speed is objectionable and tends to derange the dough-sections on the pan. I therefore devised a feeding mechanism which is adapted to receive the dough constantly and to deliver it periodically or intermittently, thus permitting a uniform movement of the pans. Essentially this intermittent feeding device comprises a differentially-speeded carrier, the dough-receiving portion of which may, as in this case, travel at constant and uniform speed, while the delivering portion is intermittent in its movement. Between the constantly-moving and intermittently-moving portions of said carrier is a portion in which the speed is gradually differentiated, so as to avoid any sudden change of movement. In the construction shown F is an endless apron or feed-belt, which passes over a suitable driving-roll, such as G, and has a portion *d* thereof extending between the roll H and the bar I upon which the dough is fed. This portion *d* at its rear end is preferably in alinement with the apron E, which passes around a thin-edged bar J and thence around its drive-roll K, the thin edge of the bar J being in close proximity to the roll H. The bar I, which is also provided with a thin edge, extends in proximity to a carrier L, upon which the pans on which the dough is to be deposited are carried. Beneath the portion *d* of the apron F is arranged a flexible supporting-plate M, which at its forward edge is pivotally connected with the bar I, and at its rear end—that is, the end nearest the apron E—it is connected to the movable bar N. This bar is carried by rock-arms O, which are pivoted at P and are adapted to be periodically rocked in the direction of the arrow until the position indicated in dotted lines is assumed. The rocking of the arms O will thus carry the bar N toward the bar I, with the result that the flexible plate M will be bowed upward and will carry with it the portion *d* of the apron, thereby increasing the length of the apron between the bar I and the roll H. This increased length of the section *d* is provided for by the movement of the take-up roll Q, which is preferably carried by arms R, connected with and extending substantially at right angles to rock-arms O. The roll Q is arranged between two idler-rolls S and T, and the apron F passes around these rolls in the manner shown. Thus when the rock-arms O are moved, as before described, and the plate M is bowed upward the roll Q will be simultaneously moved to provide slack in the lower portion of the apron F, which is taken up in the upper portion *d* thereof by the bowing of the plate.

From the description above given it will be understood that if the roll G is revolved constantly and at a speed which will impart to the belt F in contact therewith the same speed as that of the belt or apron E the same speed will be imparted to all portions of said belt so long as the plate M remains in the position indicated in full lines. When, however, the rocking of the arms O cause a lateral deflection or bowing of the plate M, this will take up the movement of the belt or apron as it leaves the roll H and between said roll and the bar I. At the same time the movement of the take-up roll Q will provide slack in the apron between the feed-roll G and bar I, and the result will be that the movement of that portion of the apron which is in contact with the edge of the bar I will be retarded or temporarily arrested, and during this interval one pan on the carrier L will be removed and another one brought into position for receiving the dough. It will be seen that the receiving portion of the apron does not suspend its movement or change its speed, but that in place of feeding the dough on the apron directly to the bar I the direction of movement is changed, and the path of the apron is a curved line, which as a matter of course is longer than a straight line. As soon as the limit of lateral deflection or bowing of the plate M is reached movement at normal speed will again be transmitted to that portion of the apron in contact with the bar I, which will again cause the cut dough on the apron to be fed off therefrom. Before the pan is filled it is necessary that the plate M should be restored to its normal position, so that the bowing action may be repeated to again arrest the feed from the apron. This restoration of the plate M is accomplished by the reverse movement of the rock-arms O, and the rock-arms R, actuated thereby, will carry the roll Q, so as to take up the slack occasioned by the straightening of the portion *d*. The effect of this return movement is to slightly accelerate the speed of the belt passing around the bar I; but on account of the gradual movement of the rock-arms O this acceleration is very slight. To prevent possibility of displacement of the cut dough during the bowing of the plate M, a retaining-apron T′ is preferably arranged above the section *d* of the apron F and is spaced therefrom, so as to permit of the passing of the dough-sections therebetween. This apron is also provided with a movable take-up roller U, and the latter is arranged to be operated simultaneously with the operation of the roller Q and the bowing of the plate M, so as to provide slack in the apron T′. This will permit the apron to conform to the shape of the upwardly-bowed section d of the carrier F and will hold the cut dough-sections in position during the bowing movement. The apron T′ is driven at the same speed as the apron F and during bowing is given the same differential speed, so that it would in no way interfere with the feeding of the dough.

The mechanism for operating and timing the various devices above referred to may be of any suitable construction, but as shown is constructed as follows:

As has been described, the stripping mechanism comprises the alternately-reciprocating feeders D and D′, together with means for applying suction to the bearing portions of said feeders during their forward movement and for relieving the suction before the return movement. I also preferably provide means whereby the returning feeder is slightly depressed, so as not to interfere with the dough on the forwardly-moving feeder. These movements are effected through the actuation of cams e on the shaft f, as shown in Figs. 3 and 4. The feeders D and D′ are connected to rocking standards g and g'. These standards are reciprocated laterally by rock-arms h, sleeved on the shafts i adjacent to the shaft f, said rock-arms being connected by links j with the feeders D and D′. The rock-arms h are actuated by rock-arms k, secured thereto, which have antifriction-rolls k', engaging with the cams e. Thus in the rotation of the shaft f the feeders D and D′ will be reciprocated. The feeders are lowered during their return movement by rock-arms l, which are connected to the standards g and g'. These rock-arms l are secured to sleeves l', which are loose upon the shafts i. These sleeves are also provided with actuating rock-arms l^2, which project into proximity to cams e' on the shaft f and engage therewith through the medium of antifriction-rolls l^3. The cams e' are fashioned to raise and lower the rock-arms l^2 and through the medium of the sleeves l' and rock-arm l correspondingly move the feeders D and D′. The rocking standards g and g' will permit of this raising and lowering by reason of slotted bearings g^2, which engage with the pivots g^3 for said standards. The suction in the feeders is controlled by valves, such as n, which are arranged to open and close the ports o, connecting the feeder-heads with the suction-conduit o'. In the forward movement of each feeder its valve n is open; but before the limit of forward movement is reached the valve is automatically closed, preferably by the engagement of projecting lugs or pins n' and at the ends of the valve with stationary stops n^2 on the frame. At the end of the return movement or during the initial forward movement of the feeder the valve n is opened by any suitable mechanism, such as the stops n^3, for engaging with the pins n'.

For effecting the bowing of the plate M and the coacting movement of the tighteners Q and U a suitable mechanism is provided, such as shown in Fig. 5, in which P is a cam connected with the driving-roll G. q is a bearing on the rock-arm O, which is adapted to engage with the cam P and to be actuated thereby. r is a link which is connected at its upper end with the tightener-roll U and at its lower end is pivotally connected at s with the rock-arm O. The construction just described is such that in each revolution of the roll G the cam P will cause a rocking movement of the arms O, due to the mounting of the roller-bearing q up the inclined portion p' of the cam. The cam is so fashioned that this mounting of the inclined portion will bow the plate M, so as to take up the slack fed by the continued movement of the roll G. At the same time the movement of the rock-arm O will correspondingly move the take-up roll Q and through the link r will also move the take-up roll U. As soon as the high portion of the cam is reached by the roller-bearing q the apron F will be again fed in all portions of its length, and during the remaining rotation of the cam it will permit the gradual return movement of the rock-arm O to straighten the plate M.

While I have described the construction of a differential carrier which is adapted to receive the dough constantly and to deliver it intermittently or periodically, it is obvious that substantially the same mechanism might be so arranged as to receive the dough intermittently and deliver it constantly. Wherever the conditions are such as to require this latter arrangement, the feed-roll for driving the apron may be driven intermittently and the mechanism for bowing the plate M so arranged as to operate in the reverse order—that is, during the feeding movement of the roll the plate would remain bowed and during the interval in which the roll is stationary the plate would be straightened, so as to continue the discharge therefrom.

What I claim as my invention is—

1. In a feeding mechanism, a carrier, means for constantly feeding the receiving portion of said carrier, and for variably feeding the discharging portion thereof.

2. In a feeding mechanism, a carrier, and means for constantly moving the receiving portion thereof, and for intermittently moving the discharge portion.

3. In a dough-feeding mechanism, a differential carrier having a progressively-changing speed.

4. In a dough-feeding mechanism, a differential carrier and means for producing a progressive retarded speed on the carrying portion thereof.

5. In a dough-feeding mechanism, a continuous carrier-surface, and means for differentially moving said surfaces at the receiving, and discharging points.

6. In a feeding mechanism, a carrier-surface, means for driving said surface, and means for progressively changing the speed between the receiving portion thereof, and the discharging portion.

7. In a feeding mechanism, a carrier, means for periodically progressively retarding said carrier from the receiving portion to the delivering portion thereof, and means for elongating the path of movement of the intermediate portion of said carrier.

8. In a feeding mechanism, a carrier, and means for alternately retarding and accelerating the speed of said carrier progressively between the receiving and the delivering portion thereof.

9. In a feeding mechanism, a carrier, means for alternately retarding and accelerating the said carrier progressively from the receiving portion to the delivering portion thereof, and means for deflecting an intermediate portion of said carrier, to elongate the path of movement thereof.

10. A dough-feeding mechanism for a dough mass in a sheet form comprising a progressively-retarded carrier, over which said sheet is adapted to be fed.

11. In a dough-feeding mechanism, a flexible traveling carrier, and means for elongating by deflecting said carrier intermediate the dough-receiving and dough-discharging portions thereof to produce an intermittent movement of the latter during the constant movement of the former.

12. In a dough-feeding mechanism, a flexible carrier, a supporting-surface for said carrier intermediate of the dough-receiving and dough-discharging portions thereof, and means for bowing said supporting-surface for the purpose described.

13. In a dough-feeding mechanism, a flexible endless carrier, means for driving said carrier at constant speed at the dough-receiving portion thereof, and means intermediate the dough-receiving portion and dough-delivering portion for deflecting said carrier to produce an intermittent dough delivery.

14. In a dough-feeding mechanism, a flexible endless carrier, means for driving said carrier at constant speed at the dough-receiving portion thereof, means between said dough-receiving portion, and the dough-delivering portion of the carrier for deflecting the same laterally, to receive the constantly-fed portion, and coöperating means in the return portion for providing slack, whereby an intermittent operation of the dough delivery is obtained.

15. In a dough-feeding mechanism, a flexible endless carrier for receiving the cut dough, means for driving the receiving portion of said carrier constantly, and at uniform speed, a pan-carrier traveling adjacent to the discharge portion of said endless carrier, and means intermediate the dough-receiving, and dough-discharging portions of said endless carrier for deflecting the same laterally to arrest the discharge between pans.

16. In a dough-feeding mechanism, an endless flexible carrier for receiving and delivering cut dough, means for driving the receiving portion thereof constantly, means intermediate the receiving and delivering portion for bowing and straightening said carrier to produce an intermittent discharge, a retaining-apron above said carrier, and means for feeding and providing slack in said apron to permit of maintaining the same in parallel relation to said carrier during the bowing thereof.

17. In a feed mechanism, an endless belt to which material is fed and from which it is to be delivered, means for giving its receiving portion a constant rate of travel, and for varying the speed of its discharge portion.

18. The combination of an endless belt, a drive-pulley at a point thereof which drives the belt a uniform speed at that point, a loop in said belt, and means for increasing and decreasing the size of said loop, whereby the speed of travel of the belt behind said loop will be intermittent.

19. A feed mechanism having receiving and delivering portions in fixed relation to each other, combined with means for varying the length of the carrier between the receiving and delivering portions.

20. In a feed mechanism, a belt-carrier, having fixed receiving and delivering portions, and automatic means for increasing and decreasing the length of the carrying-surface thereof.

In testimony whereof I affix my signature in presence of two witnesses.

ALEXANDER W. COPLAND.

Witnesses:
H. C. SMITH,
JAS. P. BARRY.