(No Model.)

J. T. HAWKINS.

SHEET DELIVERY APPARATUS.

No. 245,375. Patented Aug. 9, 1881.

Fig. 1.

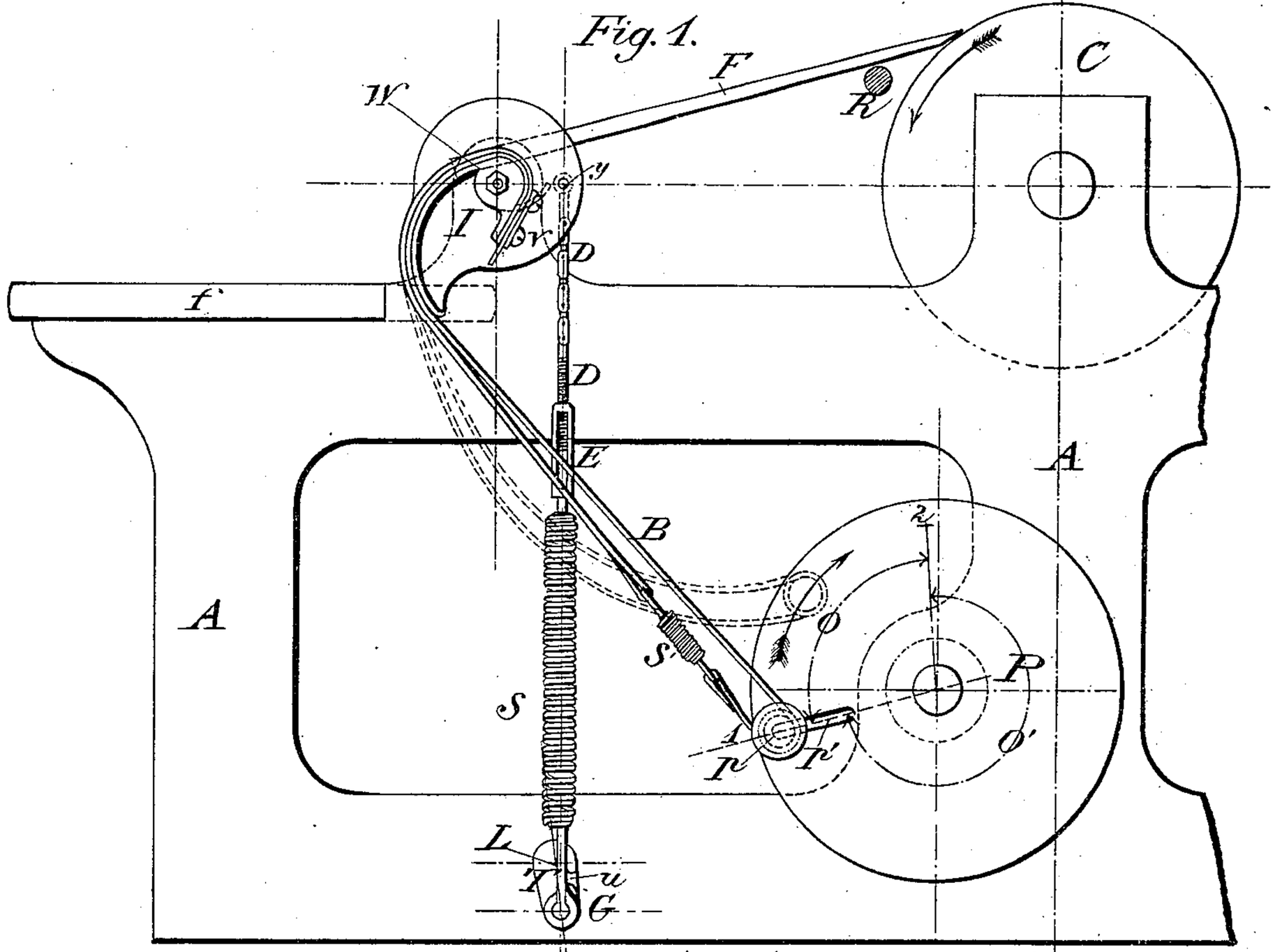

Fig. 2.

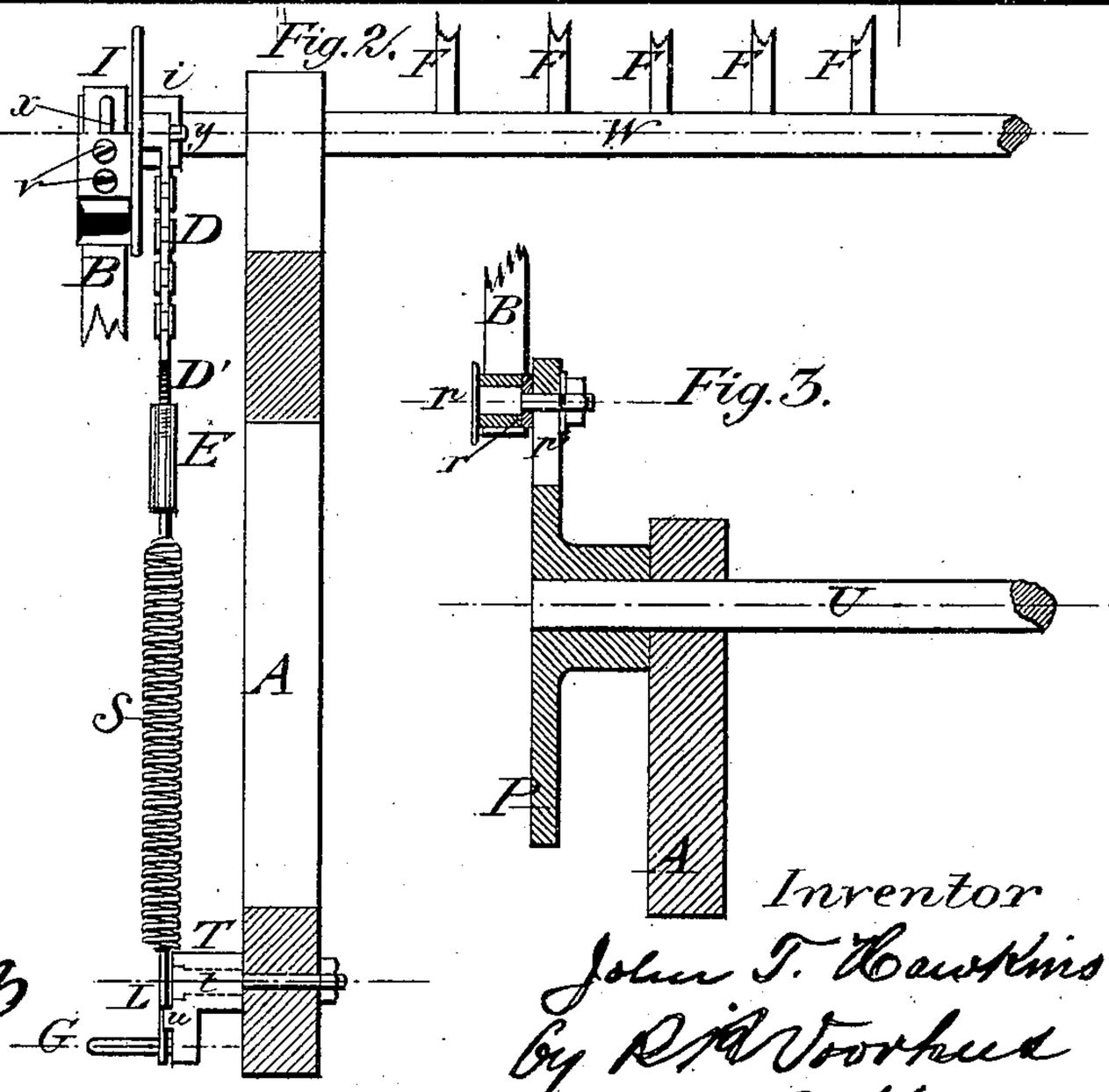

Fig. 3.

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SHEET-DELIVERY APPARATUS.

SPECIFICATION forming part of Letters Patent No. 245,375, dated August 9, 1881.

Application filed September 20, 1880. (No model.)

To all whom it may concern:

Be it known that I, JOHN T. HAWKINS, of Taunton, in the county of Bristol and State of Massachusetts, have invented a new and useful Improvement in Sheet-Delivery Apparatus for Printing-Presses, which improvement is fully set forth and illustrated in the following specification and accompanying drawings.

This invention relates to that form of fly or sheet-delivery in which the sheet of paper, after having been delivered upon the fly-fingers, is carried by said fingers into a horizontal position in consequence of said fingers describing a considerable arc for the purpose of depositing the sheet flat upon a table or fly-board, said arc varying in different forms of press from about ninety degrees in those presses in which the fly-fingers receive the sheet in a nearly-vertical position to about one hundred and eighty degrees in those presses in which the sheet is received nearly horizontally and then turned completely over when deposited upon the fly board or table. In all such flies or sheet-deliveries it is desirable to bring the fly-fingers nearly in contact with the table or fly-board, in order to prevent the sheets of paper from floating upon the air after the fly-fingers are caused to recede from said table, so that the sheets may be piled evenly on the board. It is also at the same time equally essential that the fly-fingers should not press forcibly or slam upon the printed sheets as successively discharged and piled upon the table, as such pressure or slamming will produce offsetting of the ink from the printed side of one sheet to the back of an adjoining sheet.

In most varieties of printing-presses using the above-described form of sheet-delivery the fly-fingers are impelled when describing their arcs of forward progression—that is, toward the fly table or board, with (or without) a sheet upon them—by either a spring or weighted levers, the force of which may be adjusted proportionately to the variable air-resistance encountered due to difference in size of sheets delivered, so as not to press upon the pile of sheets with too great force; but, as in printing, it frequently happens that no sheet is delivered to the fly-fingers during an interval of one or more revolutions of the press, the resistance of each sheet to passage through the air is removed from the fly-fingers when the previously-adjusted weight or spring urges the fly-fingers over to and upon the pile of papers with such force as to cause said fingers to slam and offset the sheets. In some forms of press, however, means are provided for rendering the fly-fingers inoperative when the press is being run for any purpose without the sheets being fed through it, as is very often necessary; but in all such cases the tripping mechanism is rarely competent to prevent at least one excursion of the fly-fingers and their consequent slam upon the pile before said mechanism comes into action.

The object of this invention is to obviate the above-mentioned undue pressure upon the pile of sheets, and also to invariably prevent slamming of the fly-fingers upon the same when one or more sheets of paper are missed or not delivered by the fly-fingers.

In order to accomplish these desirable objects, my invention consists of the parts hereinafter described as particularly contributing thereto, and specifically set forth in the claims; and the distinctive features and principle underlying the invention may be described as follows: The fly-fingers are urged in their arc of progression toward the fly-board by a positive and unadjustable force, so that the extent and rapidity of such excursion of the fly toward the fly-table shall be the same whether it has a sheet upon it or not; but it is urged through its return-arc, in which it is invariably without a sheet upon it, and consequently offers a uniform resistance, by means of a spring so arranged as to make its effective tension practically uniform, the fly being prevented from slamming upon its rest or stop on its said return by means of an involute pulley, as hereinafter shown.

In the accompanying drawings, Figure 1 illustrates a side elevation of the whole device, showing a part of the side frame, A, the cylinder C, and fly-board *f* of a cylinder-press in which the sheet is received upon the fly F from the top of the cylinder C and deposited upon the fly-board *f* by the fly F, describing an arc approaching one hundred and eighty degrees, and turning the sheet completely over in its delivery upon the fly-board *f*. Fig. 2 shows an end elevation of the double involute

pulley I *i*, with its attached parts; and Fig. 3, a similar view of the crank-plate P in section.

In Fig. 2, for the sake of clearness of illustration, the fly-fingers F F are shown in a vertical position, while the double involute pulley I *i* is shown in position corresponding to the position of the fingers F F in Fig. 1. For the same reason the crank *p*, carrying the roller *r*, is shown in the vertical position in Fig. 3.

In the several figures of the drawings like letters refer to the same parts in each figure.

The letter R indicates a rod extending across the press, upon which the free end of the fly rests while receiving the sheet from the cylinder C.

The crank-plate P is actuated by the shaft U so as to make one revolution to each impression. The said plate P carries a crank-pin, *p*, having a roller, *r*, thereon, which may be adjusted in the slot *p'* for varying the stroke or amount of motion given to the belt B. The belt B is looped over the crank-pin *p*, the free ends of the belt extending to and enwrapping the larger involute, I, of the involute-shaped pulley I *i*, one end being superimposed upon the other, passing double around the involute I, and secured by a plate and screws, V, one of the free ends of the belt B being slotted, as shown at *x*, Fig. 2, to permit of the adjustment of its length.

The involute-shaped double pulley I *i* is secured upon a shaft, W, to which the fly-fingers F F are secured. On the back of the involute pulley I is a smaller involute pulley, *i*, (shown in dotted lines in Fig. 1,) and a wrist-pin, *y*, to which is attached a short chain, D. The said chain terminates at its lower end in a threaded rod, D', engaging a turn-buckle, E, (for adjusting the tension of the spring S,) the lower end of which turn-buckle is attached by a short rod to the helical spring S. The lower end of the said spring is attached to a short link, L, which engages the pin G, which pin is situated near the bottom of the press, and, in order to be operated by the foot, is made to project considerably from the side of the short crank T, in which it forms a wrist-pin, the said crank being pivoted upon the stud *t* secured to the frame of the press. On the said short crank T is a stop, *u*, which prevents the crank from being turned to the right from the position seen in Fig. 1 by the effort of the spring S, the said stop coming in contact with the link L when the crank T is in a position a little past the vertical to the right, as seen in Fig. 1, with the pin G downward.

The object of using the crank T is that all tension may be removed from the spring S when the press is at rest with the fly F in the position seen in Fig. 1, for it may be required to place the fly F in a position away from the cylinder without moving the press, for purposes requiring access to the cylinder. The operation of thus releasing the fly F from the action of the spring S is momentarily effected by the pressure of the foot upon the long pin G, thereby moving said pin to the left from the position seen in Fig. 1. The fly, if thus thrown over upon the fly-board, or upon the pile of paper upon said board, will there remain motionless until the spring S be again thrown into action, as described.

The operation of the invention is as follows: The crank-pin *p* being so adjusted in the slot *p'* that in describing any arc, O', (less than a whole revolution of the crank,) of sufficient length for the necessary throw or vibration of the fly F from the stop R to the table *f* and return, (the double belt B during this operation being both unwound and rewound upon the involute pulley I,) said pin, through the remaining arc O of its revolution, will permit the fly F to remain at rest upon the stop R. During this interval of rest the sheet is delivered by any well-known mechanism from the cylinder C to and upon the fly F, the belt B during this time becoming slackened up, as shown by the dotted lines in Fig. 1. Upon the arrival of the crank-pin *p* at the point 2 of its rotation in the direction indicated by the arrow, the belt B becomes again tightened and effects the delivery motion of the fly over to the fly-board *f*, whence it returns to its rest or stop, the rod R, (by the means below described,) by which time the crank-pin will have arrived at the point 1 of its revolution, when the belt B again commences to slacken, as before described, and another sheet is received from the cylinder upon the fly F.

In the operation just described of unwinding the belt B from the large involute-shaped pulley I, and thereby throwing the fly forward to effect its delivery, the chain D is necessarily wound upon the small involute-shaped pulley *i*, before described, which pulley is so proportioned that the resistance caused by the reaction of the spring S, to which the chain D is attached, remains practically equal at all points of the arc described by the fly F. It can now be readily perceived that the return of the fly after its delivery, as just described, will be promptly effected by the reaction or reverse action of the spring S in unwinding the chain D from the small involute pulley *i*. The large involute pulley I is, however, so proportioned that when the fly F is approaching its rest R near the termination of its return-stroke it shall be eased down upon said rest without violence or noise, said pulley at such time taking up the belt B fast enough to cause the terminal return motion of the fly under the reaction or retraction of the spring S to be very slow.

From the construction of the involute pulley I it is obvious also that the greatest strain is brought upon the belt B by the pull of the crank *p* when the fly is about completing its delivery-stroke; but the yielding character of the increasing pile of paper upon the fly-board and the very slight further travel of the fly after reaching the top of the pile prevent undue pressure upon the pile by the fly. Insert-

ed in the lower strand of the double belt B is a short spring, S′, whose pressure imparts a certain degree of elasticity to the belt under the following conditions of service: While the fly F is delivering a sheet of paper to the fly-board *f* the belt B and the spring S′ are both under a tension due to the force of the crank's pull upon the belt in moving the sheet upon the fly against the resistance of the air, which resistance rapidly approaches zero when the delivery-throw of the fly is about to terminate; hence, said tension being thus removed, the spring contracts. But when the fly reaches the pile of paper upon the fly-board, as the pile increases in height, tension is again brought upon the belt B and spring S′ by the continued pull of the crank upon the belt B against the slight resistance of the growing pile to the further advance of the fly, which resistance, however, will not be materially greater (owing to the yielding of the pile) than that just previously offered by the air to the delivery-passage through it of the sheet upon the fly. Both of said resistances, it will be observed, though offered through a long lever—the fly itself—are opposed by the pull of the crank *p* upon the belt B only through a short lever formed by the minimum radius of the involute pulley I; hence all strains in practice brought upon the belt B are amply provided for by the elasticity of the spring S′, which can yield sufficiently to any ordinary resistance with which the fly may meet and effectually assist in preventing its too great pressure upon the pile of printed sheets.

It is obvious that the double involute pulley I *i* may be separated into two pulleys, each situated at opposite ends of the shaft W, should such change of position in any case be more convenient in the practical operation of the machine. From the construction and operation of the invention as above described, it will be perceived that the velocity of the fly in either direction remains unchanged, either with or without a sheet of paper upon it; therefore the fly cannot slam upon the pile of sheets from any failure at any time to receive a sheet upon it, and the pressure exerted by the fly upon the pile of paper upon the fly-board *f* is so slight, as fully explained, as to be insufficient to cause offsetting of ink from one sheet to another.

Having thus fully described my said improvement in sheet-delivery apparatus for printing-presses as of my invention, I claim—

1. In a printing-press adapted to operate the fly thereof, the combination of the following-named elements: an involute-shaped pulley or pulleys, a looped belt, a crank, a returning-spring, and chain or band, all arranged and operating substantially as and for the purposes set forth.

2. In a printing-press, secured to a fly-shaft or frame, reversed involute-shaped pulleys, respectively provided with an enwrapping belt, strap, or chain, by means of whose reciprocal winding and unwinding said pulleys are operated, thereby imparting angular motion in opposite directions to said fly-shaft, substantially as and for the purposes set forth.

3. In a printing-press, in combination with an involute-shaped pulley, I, secured to a fly shaft or frame, as described, a looped belt, B, and crank *p* operating said pulley, substantially as and for the purposes set forth.

4. In a printing-press, in combination with an involute-shaped pulley, *i*, secured to a fly shaft or frame, as described, a spring, S, operating said pulley by means of an interposed chain, cord, or band, substantially as and for the purposes set forth.

5. In a printing-press, secured to a fly shaft or frame, an involute-shaped pulley and an enwrapping looped belt, provided with an extension-spring, in combination with means to unwind said belt from said pulley, whereby angular motion is imparted to said fly-shaft in but one direction, substantially as and for the purposes set forth.

6. In a printing-press, a returning-spring, S, adapted to operate a fly shaft or frame, as described, in combination with a releasing-crank, T, substantially as and for the purposes set forth.

7. In a printing-press, in combination with a fly shaft or frame having secured thereon involute-shaped pulleys I *i*, a looped adjustable belt, B, connected to a crank, *p*, a returning-spring, S, a chain or band, D, and a releasing-crank, T, substantially as and for the purposes set forth.

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