3 Sheets—Sheet 1.

S. D. TUCKER.

PAPER-FOLDING MACHINE.

No. 186,385. Patented Jan. 16, 1877.

Fig. 2

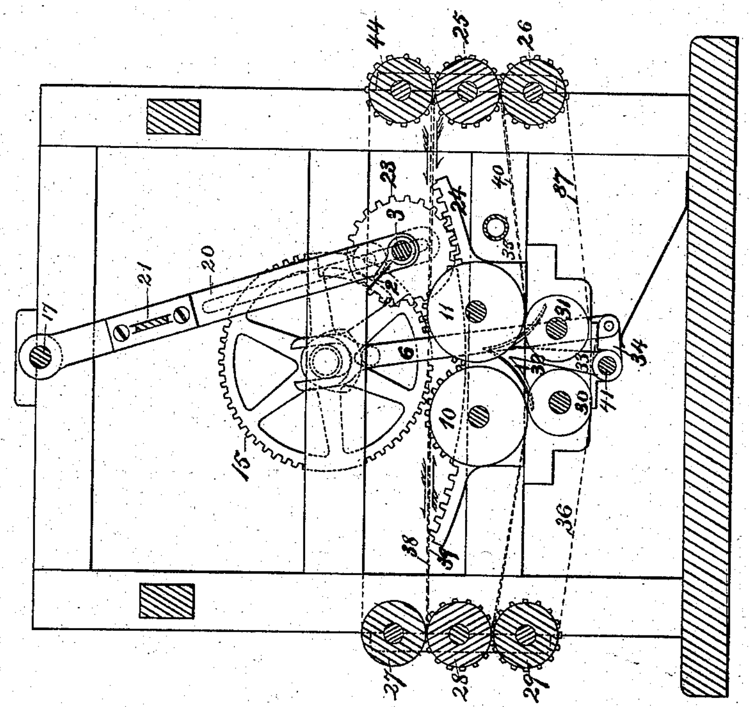
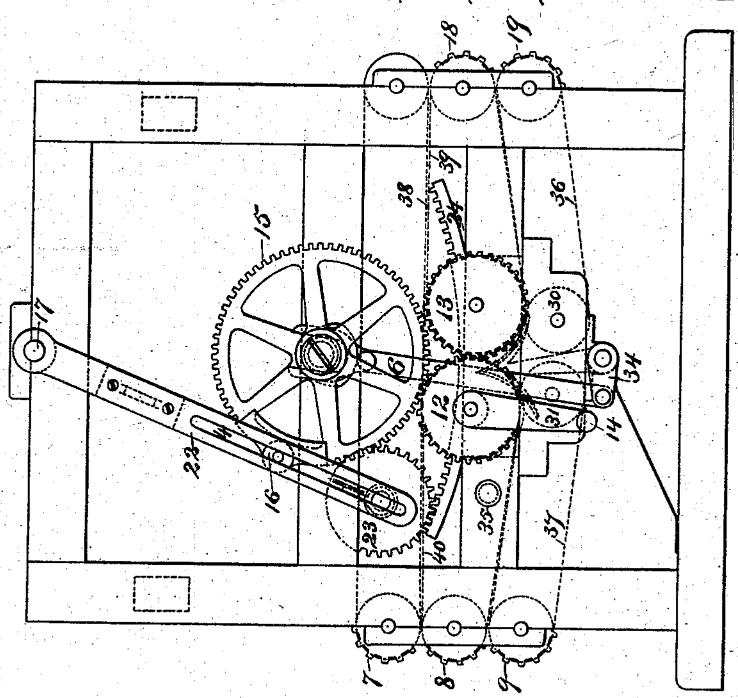


Fig. 1



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3 Sheets—Sheet 2.

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Fig. 3

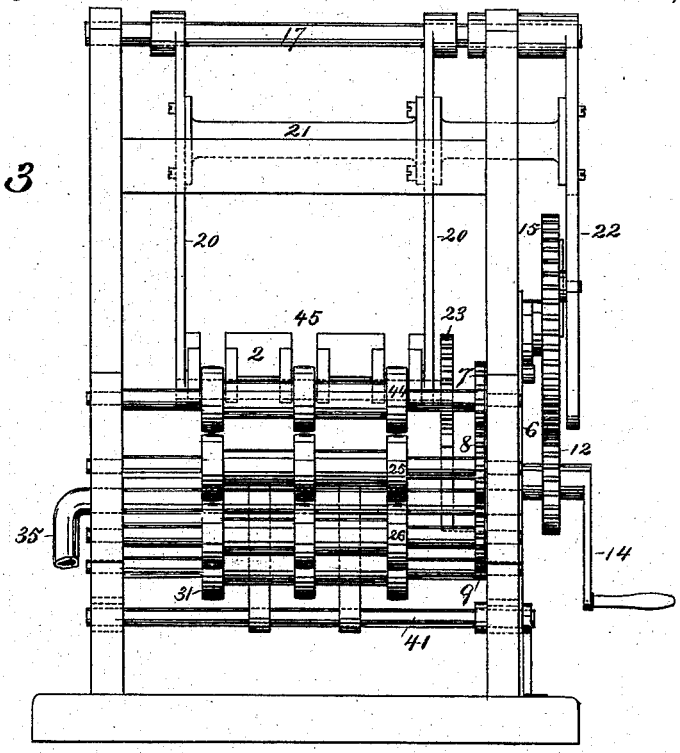
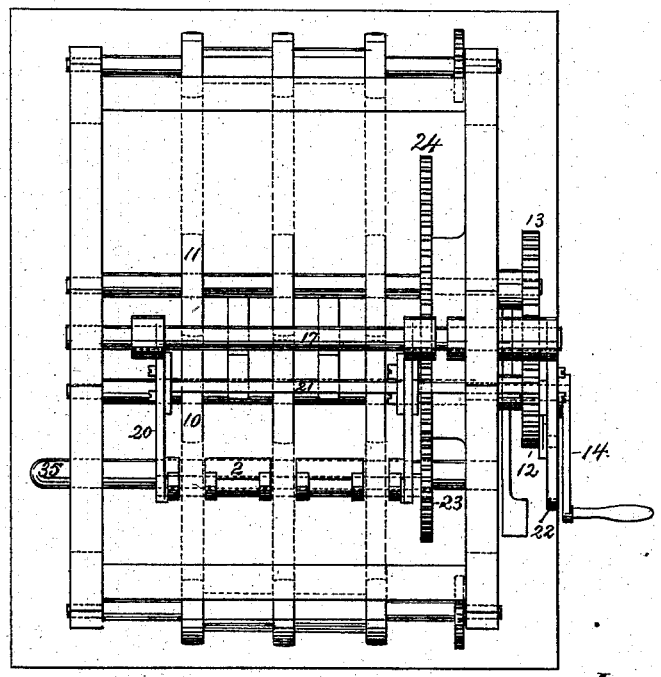


Fig. 4



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3 Sheets—Sheet 3.

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Fig. 6.

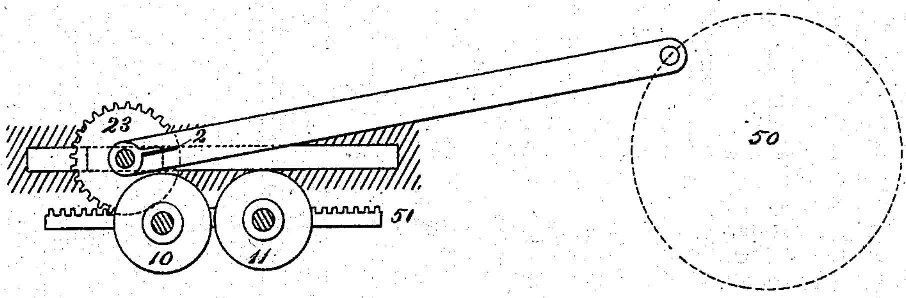
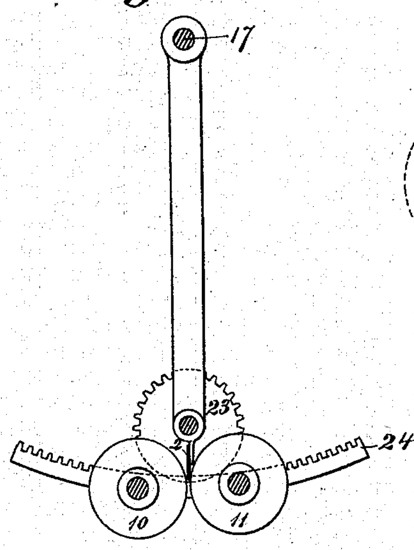


Fig 5.



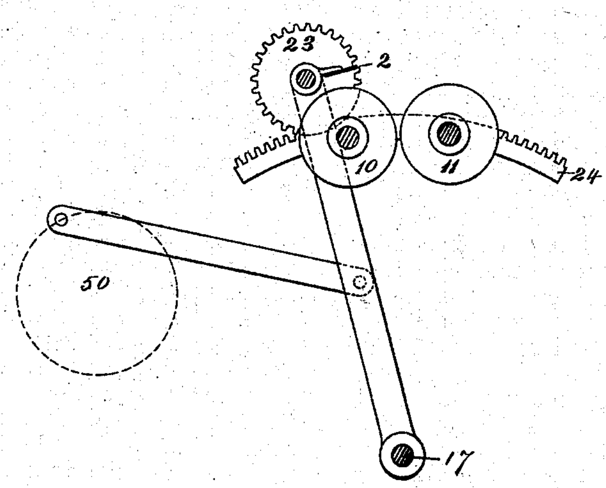


Fig 7.

Witnesses

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[illegible]

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UNITED STATES PATENT OFFICE.

STEPHEN D. TUCKER, OF NEW YORK, N. Y.

IMPROVEMENT IN PAPER-FOLDING MACHINES.

Specification forming part of Letters Patent No. **186,385**, dated January 16, 1877; application filed April 20, 1876.

To all whom it may concern:

Be it known that I, STEPHEN D. TUCKER, of the city, county, and State of New York, have invented certain new and useful Improvements in Partially-Rotating Folding-Machines, of which the following, in connection with the accompanying drawings, is a full, clear, and exact description:

Figure 1 is a right-hand side view; Fig. 2, a vertical section, looking from the left-hand side; Fig. 3, a front-end view; Fig. 4, a top view; Fig. 5, a view of detached parts, and Figs. 6 and 7 modified arrangements of the folding devices.

My invention relates to that class of fabric-folding machines fully described in a companion application, in which the folding-blade is so actuated as to describe cycloidal curves on entering and leaving the folding-rollers in the operation of folding the sheet. It consists in improvements in the mechanism accomplishing these movements, as will be particularly hereinafter pointed out.

The principal elements of this mechanism are a pair of folding-rollers, 10 and 11, a rotating or partially-rotating folding-blade, 2, and a vibrating folding-blade carrier. The folding-rollers 10 and 11 are supported horizontally in bearings in the frame-work, and, being geared together by toothed wheels 12 and 13, revolve in unison. The power is applied to the former, as is indicated, by the crank 14, hung fast upon its shaft. The folding-blade 2 is hung to a shaft, 3, by means of short arms whose collars are fast thereon. This shaft 3 is journaled in the ends of two or more arms, 20, which are fast upon a shaft, 17, journaled in the frame-work. These arms 20 constitute the folding-blade carrier, and they are tied together by a brace bar or rod, 21, which is extended to connect with a lever, 22, outside of the frame-work, which lever is also fast upon the shaft 17. The arms 20 are thus moved in concert with the lever 22, which is vibrated by means of a crank-pin, 16, fixed to the periphery of the toothed wheel 15, and moving in a slot, 4, in the lever 22. This toothed wheel 15 derives its rotation from the toothed wheel 12, and during each revolution causes the lever 22 and folding-blade carrier to vibrate forward and back. The folding-blade shaft carries, fixed to it at one end, a toothed wheel, 23, which meshes into the teeth of a segment, 24, fixed inside of the frame-work, and it is thereby caused to partially rotate the folding-blade during its travel forward and back in the toothed segment, when it is thus moved by the vibrating folding-blade carrier. The result of this motion is that the folding-blade is caused to travel in that path known as a hypocycloidal curve, in which path of travel it is carried into the space between the folding-rollers 10 and 11, and out at the opposite side, when its carrier is vibrated in one direction, and repeats the motion when its carrier is vibrated in the opposite direction.

The sheets of paper are fed in succession to the rollers 44 and 25 either by hand or by means of an automatic apparatus, or from a printing-press, as will be hereinafter pointed out. They are directed to a proper position over the folding-rollers by means of endless tapes, one set, 38, of which are stretched from the roller 44 to roller 27, another, 40, from the rollers 25 around the folding-roller 11, and a third, 39, from the roller 28 around the folding-roller 10. They move in the directions indicated by the arrows in Fig. 2, and the feed of the sheet is timed so that it is carried to a proper position over the folding-rollers to present the point of the desired fold to the action of the folding-blade, when said blade is carried in between the folding-rollers, as in Fig. 5, which represents it in that position, the result of which is that the sheet is doubled into the bite of said rollers, and is by them delivered out of the machine by means of tapes or rods, in a once-folded condition.

In the present case I have shown two sets of tapes, 36 and 37, stretched, respectively, from rollers 30 around roller 29, and from rollers 31 around rollers 26, which tapes, co-operating with the switch 32, whose curved points are successively shunted within the cut-away peripheries of the folding-rollers 11 and 10, direct the sheets alternately between the tapes 39 and 36, and between the tapes 40 and 37. The once-folded sheets may be delivered from these tapes, or by any other conductors, to other folding mechanisms, as set forth in Patent No. 171,196 to me December 14, 1875. In

the present instance the switch 32 is, on arms 33, fast to a shaft, 41, rocked by a crank-arm, 34, which is vibrated by a rod, 6, reciprocated by a cam on the shaft of the toothed wheel 15.

This machine may be single or double acting—that is, sheets may be successively fed to it through the rollers 44 and 25, so that the folding-blade may double a sheet between the folding-rollers during the vibrations of its carrier in one or both directions.

When operating as a single-acting mechanism the sheets will be so fed that the folding-blade will act upon a sheet while traveling in the same direction as the sheet runs into the machine, and at the point of folding the said folding-blade will move at a speed equal to that of the sheet, so that there will be no stoppage of the sheet, and hence no accumulation of paper behind the folding-blade.

When arranged to be double acting the sheets will be fed into the machine, so that each time the folding-blade enters the folding-rollers a sheet will be in proper position to be folded between them. And as the folding-blade, when carried backward, moves in a direction contrary to that in which the sheet in moving, the said folding-blade must be made to travel at a higher speed than the sheet in order that when folding the same it will not retard the movement of the sheet into the machine and cause its accumulation. This variable movement of the folding-blade carrier is accomplished by the constantly-changing positions of the crank-pin in the slot of the lever 22, whereby the leverage is changed, as is well understood.

As a sheet enters the machine its leading end is carried over the space between the folding-rollers by means of a blast of air, as is described in the aforesaid patent granted to me December 14, 1875. The blast-pipe is shown at 35, and may be supplied intermittingly or constantly with air under pressure. The sheets may also be directed by guide-rods reciprocated into proper position and out of interference with the folding-blade, as is described in a companion application filed of even date herewith.

The folding-rollers are shown, Fig. 4, as made up of separate pulleys; but they may be continuous cylinders or drums. The rollers 44, 25, 26, 27, 28, and 29 may be continuous or separate pulleys on a shaft. These rollers or pulleys are driven by gears 7, 8, 9, 18, and 19, as in Figs. 1 and 2, and they, as well as the folding-rollers, may be roughened by draw-filing or be finely fluted to more perfectly seize the sheets of paper.

As herein illustrated, the folding-blade is cut away, as at 45, to admit its passing by the tapes 8. This construction may be avoided by any means of feeding the sheet to the folding-rollers which does not form a permanent bridge over these rollers—such as the guide-arms already described.

The machine may be worked with its folding-rollers arranged one above the other. The folding blade will then enter them from the side, instead of from above or below. The sheets can then be carried past, and will descend beyond the rollers by their gravity, thus allowing the tapes 38 to be dispensed with, or at least to be carried only part way toward the folding-rollers. The folding-blade may then be made continuous.

In Fig. 6 the folding-blade carrier is made to reciprocate in right lines, a crank motion, as at 50, producing such movement, and a rack, 51, taking the place of the toothed segment. The motion of the folding-blade produced by this arrangement of the device is that of a cycloidal curve.

In Fig. 7 the devices are essentially the same as is shown in the principal figures; but the folding-blade carrier is vibrated on a center placed below the plane occupied by the folding-rollers. The motion imparted to the folding-blade in this arrangement is that of an epicycloidal curve.

This mechanism is adapted to be worked as an independent machine; or it may be connected with an ordinary printing-press. If connected with a web-perfecting printing-press it will perform a part of a continuous operation, whereby a web of paper is printed upon both of its surfaces, and cut into sheets, which sheets are folded one or more times, and delivered out of the machine. Motion may then be communicated to the folding-rollers by a train of gears meshing into the toothed wheel 12, or into the toothed wheel 15, if it be used, and a crank may give motion to the lever 22 from any suitable shaft of the printing-press.

Instead of a crank a cam properly shaped, or any equivalent device, may be used to give the vibrating motion to the folding-blade carrier.

Having thus set forth the nature and operation of my improvement, what I claim is—

1. A folding-blade moved to and fro over the folding devices, and partially rotated by a rack and wheel to operate therewith, substantially as described.

2. A partially-rotating folding-blade, the rotating movement of which is imparted by a rack and wheel, substantially as described.

3. The combination of a folding-blade carrier having a to-and-fro movement, a partially-rotating folding-blade, toothed wheel and rack, substantially as described.

4. The combination of a folding-blade carrier having a to-and-fro movement, a partially-rotating folding-blade, toothed wheel, rack, and sheet-feeding devices, substantially as described.

5. The combination of a folding-blade carrier having a to-and-fro movement, a partially-rotating folding-blade, toothed wheel, rack, and folding-rollers, substantially as described.

6. The combination of a folding-blade car-

rier having a to-and-fro movement, a partially-rotating folding-blade, toothed wheel, rack, and driving-wheel 15, substantially as described.

7. The combination of a folding-blade carrier having a to-and-fro movement, toothed wheel 23, segment-rack, with external teeth 24, and folding-rollers, substantially as described.

8. The combination of a folding-blade carrier having a to-and-fro movement, toothed wheel 23, and segment-rack with external teeth 24, substantially as described.

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

STEPHEN D. TUCKER.

Witnesses:

CHAS. W. CARPENTER,

CHARLES VERNON PACE.