(No Model.) 6 Sheets—Sheet 1.

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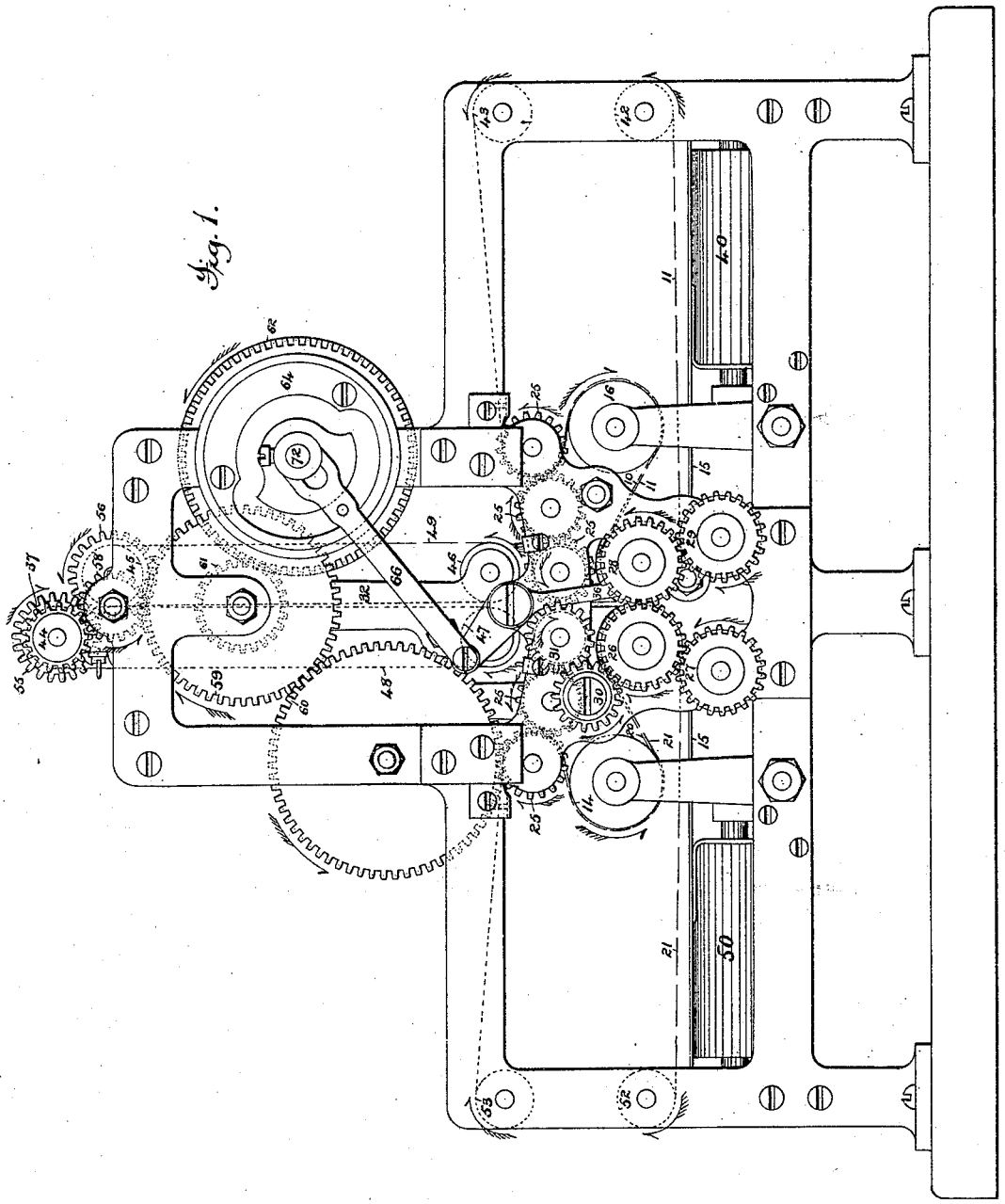
PRINTING MACHINE.

No. 265,651. Patented Oct. 10, 1882.

Fig. 1.



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(No Model.) 6 Sheets—Sheet 2.

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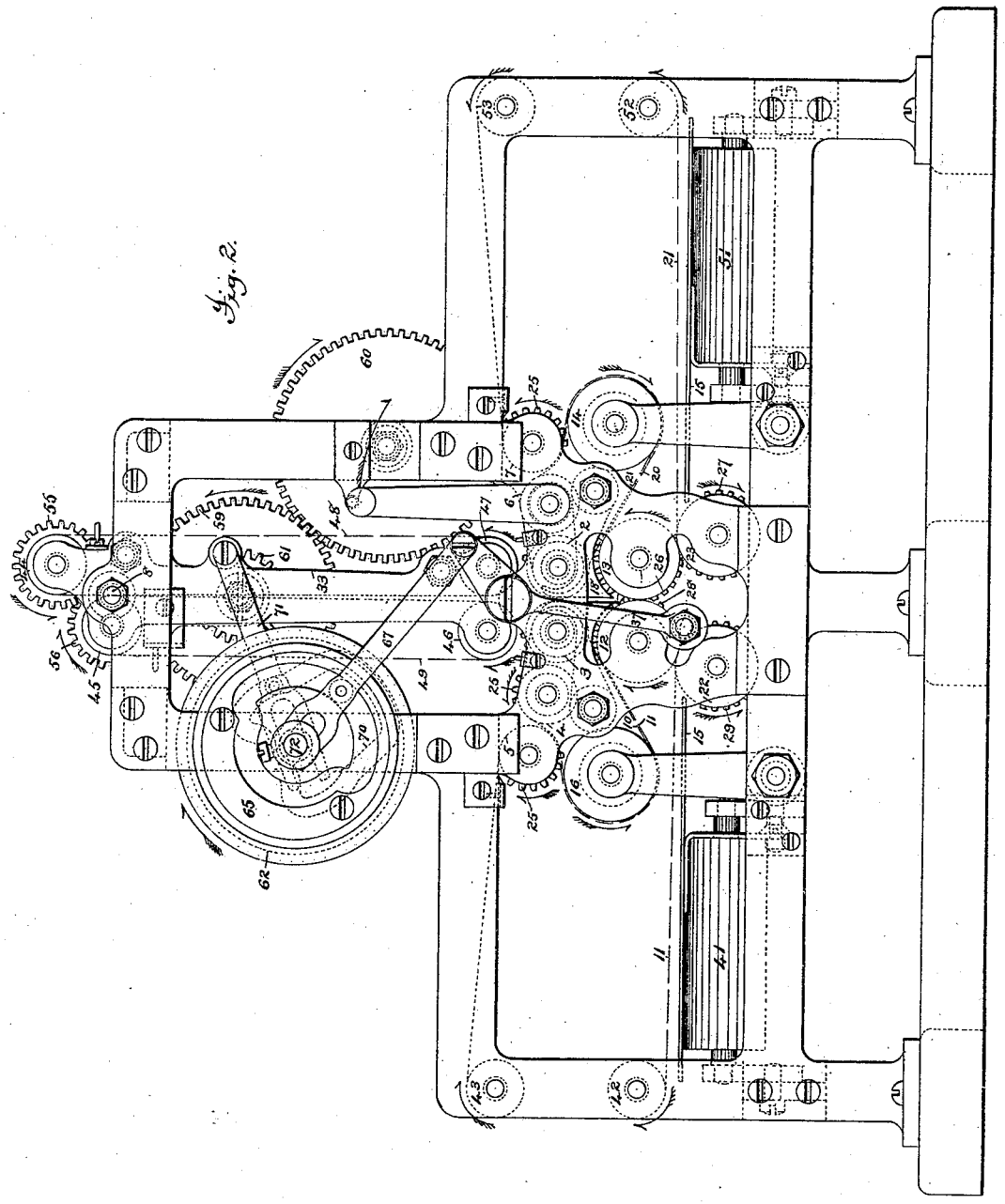
Fig. 2.



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(No Model.) 6 Sheets—Sheet 3.

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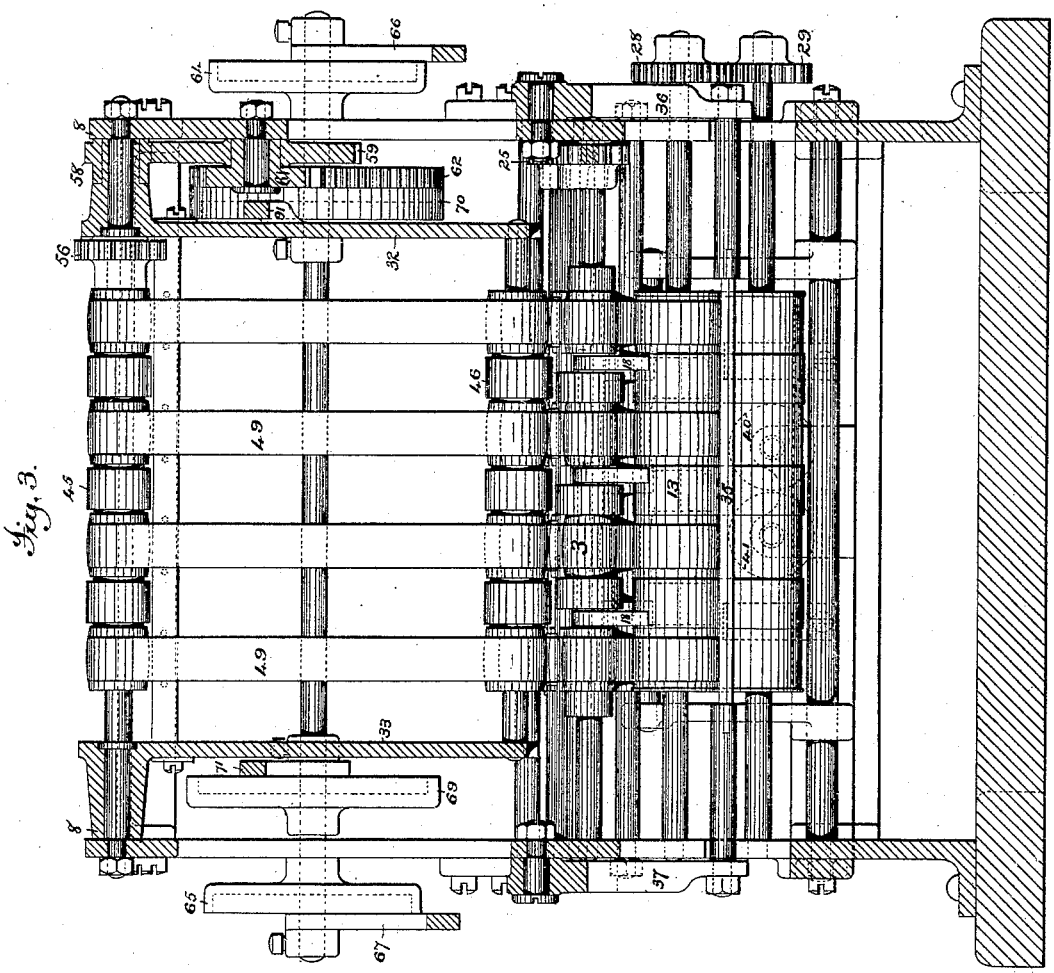

Fig. 3.

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(No Model.)

6 Sheets—Sheet 4.

E. ANTHONY & W. W. TAYLOR.

PRINTING MACHINE.

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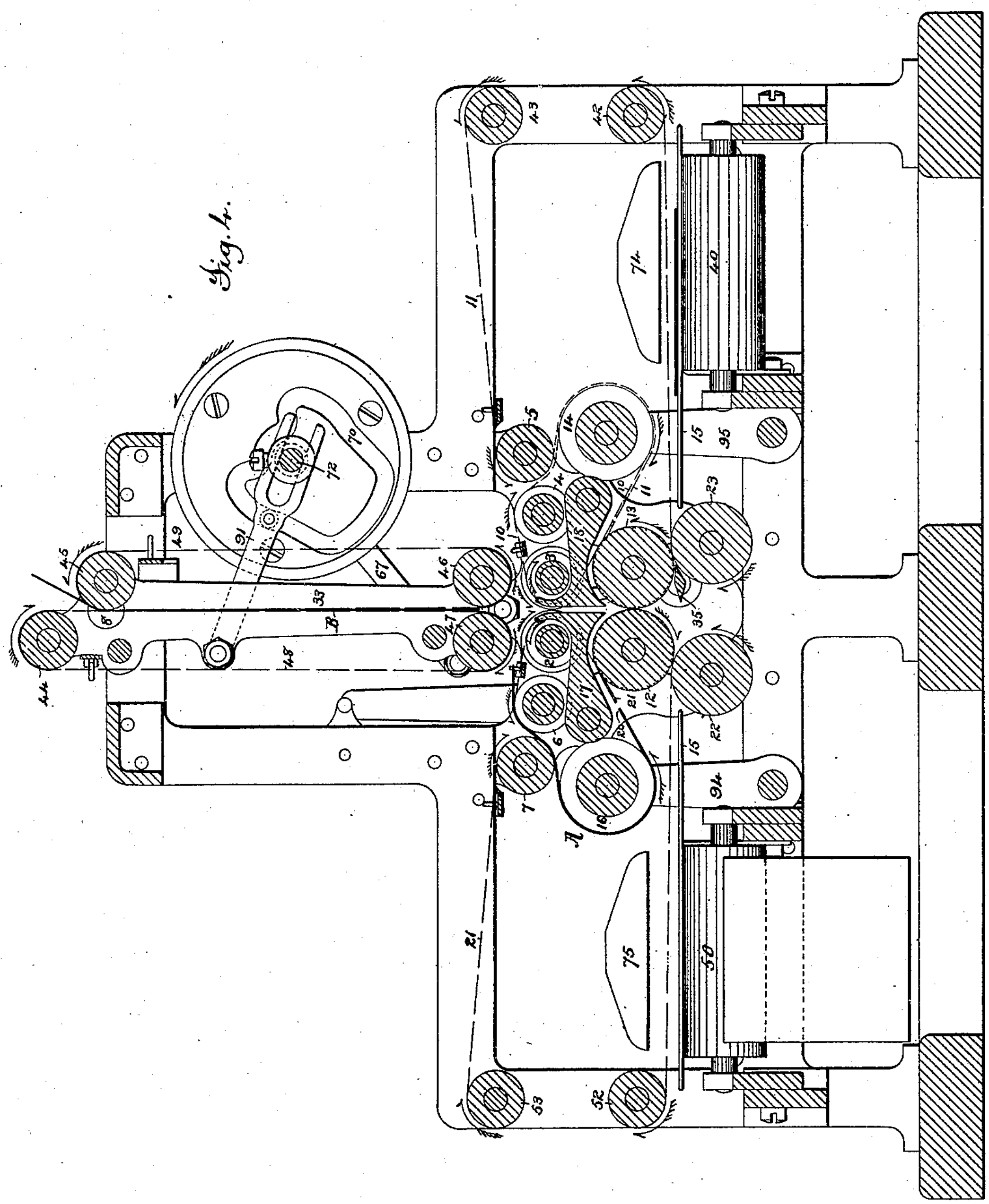

Fig. 4.

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PRINTING MACHINE.

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Fig. 6.

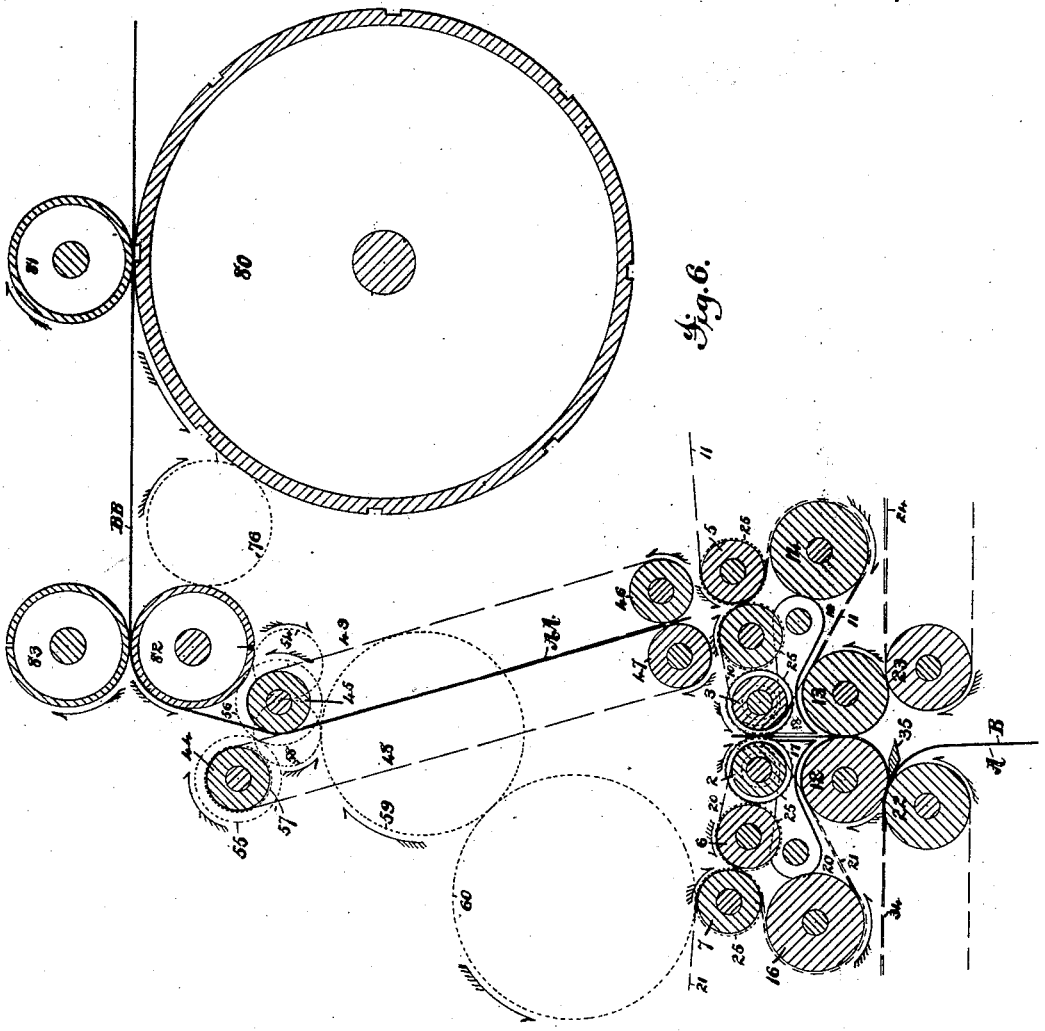
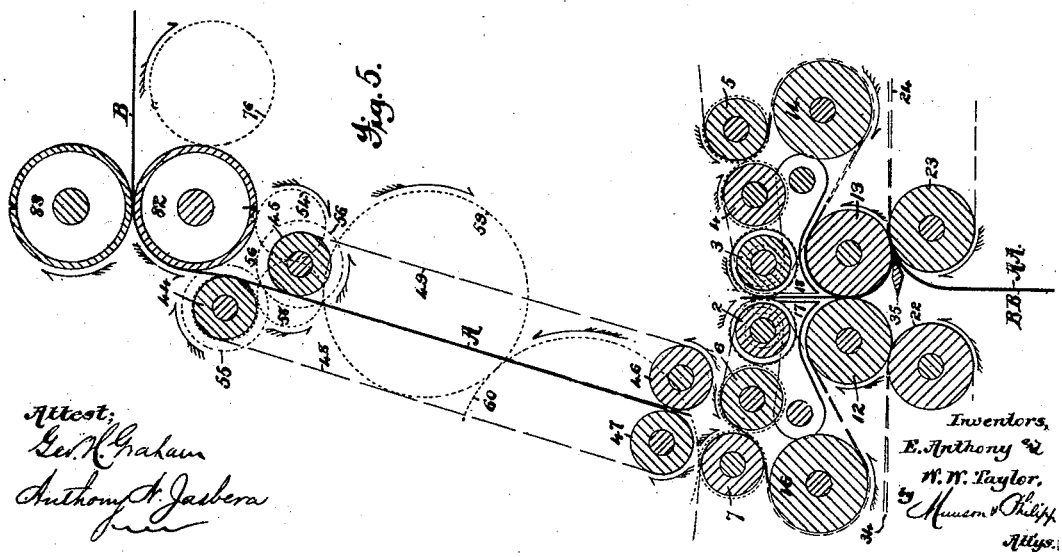


Fig. 5.



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(No Model.) 6 Sheets—Sheet 6.

E. ANTHONY & W. W. TAYLOR.

PRINTING MACHINE.

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Fig. 7.

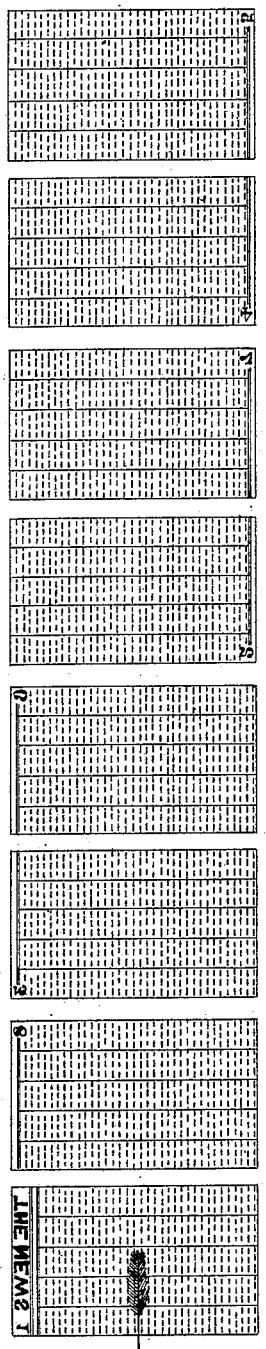
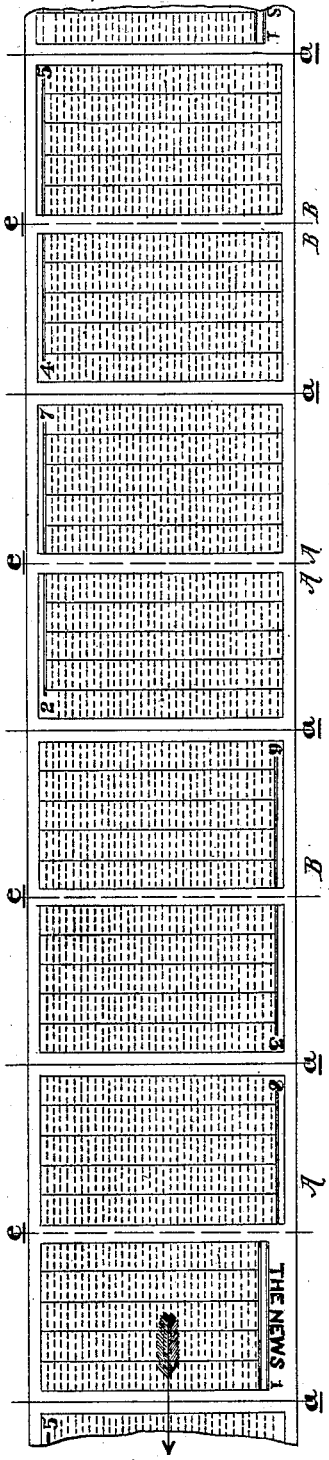


Fig. 8.



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by Munson & Philipp
Attys.

UNITED STATES PATENT OFFICE.

EDWYN ANTHONY, OF HEREFORD, COUNTY OF HEREFORD, AND WILLIAM W. TAYLOR, OF RIPON, COUNTY OF YORK, ENGLAND, ASSIGNORS TO R. HOE & CO., OF NEW YORK, N. Y.

PRINTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 265,651, dated October 10, 1882.

Application filed July 11, 1881. (No model.) Patented in England August 31, 1875, No. 3,056.

To all whom it may concern:

Be it known that we, EDWYN ANTHONY, residing in Hereford, Hereford county, England, and WILLIAM WILBERFORCE TAYLOR, formerly residing in Cambridge, Cambridge county, and now residing in Ripon, county of York, England, subjects of the Queen of England, have invented certain new and useful Improvements in Printing-Machines, fully described and represented in the following specification and the accompanying drawings, forming part of the same, in which drawings is illustrated a machine embodying the improvements effected by us, wherein—

Figures 1 and 2 show opposite side elevations of the machine; and Fig. 3 a vertical sectional elevation, looking from the center toward the right in Fig. 1. Fig. 4 shows a longitudinal sectional elevation. Figs. 5 and 6 are similar sectional elevations, illustrating the operation of the mechanisms. Fig. 7 illustrates the mode of disposing the type or forms for one of the printing-cylinders. Fig. 8 illustrates one side of a web as printed by passing once through the printing-machine.

This invention comprises mechanisms arranged to associate or collect together sheets fed in succession thereto, the purpose being to bring together the two part sheets constituting a whole, which is tantamount to once folding a sheet equal in length to that of the two part sheets. The apparatus is also arranged to deliver succeeding pairs of such collected sheets in opposite directions to folding mechanisms, whereby pairs of sheets are delivered folded at opposite ends of the machine. The apparatus is especially designed to deliver the product of a printing-machine wherein the types are arranged upon the type-cylinders in longitudinal columns or parallel with the axis of the printing-cylinder. The sheets printed in such a machine will therefore run forward in a direction at a right angle to that in which the columns are disposed, and if the forms are arranged so as to print a web with the matter for the second of a pair of sheets immediately behind the matter for the first one of a pair, said sheets, when severed from the web, will be brought together one upon the other by this apparatus, and what amounts to imparting a first fold to the whole paper will be effected. This will best be understood by a detailed description of the apparatus, which we will now proceed to give, following the same with a description of its operation.

The collecting apparatus consists of series of pathways for the sheets, to which the same are directed by means of an oscillating or pendulous conductor. These pathways consist of a central or direct pathway, which is a short one, and of lateral or auxiliary pathways, which are long ones, leading to the central pathway. The central pathway is formed by rollers 2 3 and 12 13, the latter rollers being arranged respectively with rollers 22 23, to form opposite pairs of folding-rollers. One lateral or auxiliary pathway is formed in part by the rollers 4, 5, and 14, and by tapes 10, which run from the roller 4 under roller 5, around the roller 14, and return over the roller 3, and in part by the companion tapes 11, which run from the roller 5 over the roller 14, around the roller 13, thence laterally over horizontally-arranged folding-rollers 40 41, and return over guide-rollers 42 43. The opposite auxiliary pathway is formed in part by the rollers 6, 7, and 16, with their tapes. One set of tapes, 20, run from the roller 6 under the roller 7, around the roller 16, and return over the roller 2. The companion set of tapes 21 run from the roller 7 around the roller 16, around the roller 12, and are thence stretched laterally over horizontally-arranged folding-rollers 50 51, and return over guide or leading rollers 52 53.

In Figs. 1, 2, 4 conducting-rods 15 are shown as arranged to act with the tapes 11 and 21 in conveying the sheets over the horizontal folding-rollers 40 41 and 50 51, while in Figs. 5 and 6 tapes 24 34 are provided for this purpose. Either of these devices or any other common means may be used for this purpose. All of these rollers are arranged to run in unison and in the proper direction by means of toothed wheels, as follows: The rollers 2 3 are geared together and to the rollers 4 5 6 7 by a train of toothed wheels carried by their shafts near their ends inside one side frame, (see Fig. 2, where such of them as show are marked 25.) The rollers 13 23 are geared together by toothed wheels 28 29, and the rollers 12 22 by the gear-wheels 26 27, the gear-wheels 28 26 meshing together, and the latter

with an intermediate, 30, which meshes with the toothed wheel 31 on the shaft of the roller 2, but outside of the frame-work. Any other arrangement of gearing may of course be used, in order to drive these rollers and tapes in the proper directions, indicated by the arrows.

The oscillating conductor consists of pendulous hangers 32 33, pivoted at 8 to the side frames, and provided with rollers 44 45 46 47, over which are stretched two series of endless tapes, 48 49. The tapes 48 run from the roller 44 at the upper end of the oscillating conductor and return around the roller 47 at the other end of the same. The opposite or companion tapes 49 run in like manner over the rollers 45 46, and the rollers 44 45 and 46 47 are so adjusted to each other that the tapes 48 49 will press firmly against the roller 45, but will slightly touch each other at the rollers 46 47. The reason for this will be apparent hereafter. The rollers 44 45 are geared together by toothed wheels 55 56, and are driven at the same surface speed as the tapes and rollers forming the pathways by means of a toothed wheel, 57, fixed to the shaft of the roller 44 through an intermediate, 58, which runs loose on the axis of the pendulous conductor, and the large intermediates 59 60, the latter of which meshes with the toothed wheel 25 on the shaft of the roller 7. The oscillations of this conductor are produced by cams 69 and 70 and connecting-rods 71 91, one end of said rods being pivoted to the hangers 33 32, the opposite end being forked to embrace the shaft 72, and each rod is provided with a friction roll or stud that travels in the groove of said cams 69 and 70. Its timely oscillations are accomplished by means of the pinion 61, secured to the wheel 59, which meshes with and drives a toothed wheel, 62, that is fast upon a shaft, 72, carrying these cams. Guides 17 18 are also provided to insure the proper passage of the sheets through the pathways. They are hung fixedly on rods, and are shaped so that the upper ends of their front faces lie within the peripheral line of the rollers 2 3, and their lower faces are curved to coincide with and overlie the rollers 12 13.

A vibrating double-acting folding-blade, 35, is arranged to co-operate alternately with the rollers 12 22 and 13 23, the same being hung to bell-cranks 36 37, which are vibrated by means of cams 64 65, that are mounted upon the cam-shaft 72 at opposite sides of the machine, and connected to said bell-cranks by rods 66 67, that are provided with studs or rollers entering the grooves of said cams.

The movements of all these parts will be concertedly performed, as is apparent, and the vibrating folding-blades 74 and 75, that respectively co-operate with the rollers 40 41 and rollers 50 51, will in like manner be given appropriate movements, as will said folding-rollers, in the manner common in this class of machines.

As this apparatus is designed to be connected with a web perfecting printing-machine, the arrangement of it therewith will be understood by reference to Fig. 6, where the type-cylinder 80 and last-impression cylinder 81 of such a printing-machine are shown, and in connection therewith appropriate cutting-cylinders 82 83 are also shown.

Appropriate gearing will be used to drive the delivery apparatus from the printing-machine—such, for instance, as that shown, which consists of an intermediate, 54, that meshes with the intermediate 58, which runs on the axis of the pendulous hangers, and also with a toothed wheel carried by the shaft of the cutting-cylinder 82, the latter wheel being engaged with a companion wheel carried by the cylinder 83, and through an intermediate, 76, with the toothed wheel carried, as is usual, upon the shaft of the type-cylinder 80, said wheel meshing with one upon the shaft of the impression-cylinder 81. The cutting-cylinders 82 83 do not completely sever the sheets from the web, but leave them joined by several slight filaments, which serve to continuously conduct the web between the tapes 48 49.

This apparatus is more particularly designed to co-operate with a web-printing machine in which the printing is done with ordinary type placed on a cylinder, as in the well-known "Hoe type-revolving press," and although such a printing-press forms no part of this invention, yet a brief description of the peculiar manner the forms of type are arranged on it will help to explain the object of this invention.

It is well known to those skilled in the art that in using ordinary parallel type on a cylinder it is important, first, that the columns of type shall be placed parallel with the axis of the cylinder; second, that in order to keep the column-rules sufficiently narrow the cylinder must be of considerable diameter. If all the forms of, say, an ordinary eight-page newspaper are placed on the cylinder at a time and their columns run lengthwise of the cylinder, then the above conditions will be obtained, and we shall describe this apparatus as arranged to collect and fold the sheets of an eight-page newspaper printed in this manner. As there is but one set of forms when printing from type, and this being a perfecting-press, and all the forms are on the cylinder at once, it is obvious that both sides of the web must be printed from the same forms, and of course from the same cylinder, and to do this it is necessary, after the first side of the web is printed, that it should be turned over to have its second side presented to the forms. This printing and turning of the web may be effected in the manner described and shown in Patent No. 212,880, issued to us March 4, 1879, or in any other common manner. If in such a press the heads of all the forms were placed at one end of the type-cylinder, as 80, it is plain that when the web was turned over and printed on both sides the heads of the pages on the two sides would point in opposite directions. To overcome this the heads of four successive

forms for pages 1, 8, 3, 6 are placed at the far end of the cylinder and the heads of the four remaining pages, 2, 7, 4, 5, are placed at the near end, as the cylinder is shown in Fig. 6. Fig. 7 shows these eight forms developed on a plane surface, and Fig. 8 shows a portion of the web printed from these forms. When the web is turned over and runs in to be printed on its second side its approach to the type cylinder is so timed that the page 1 will fall over the form 2, and the pages 8 3 6 will of course fall over the forms 7 4 5, and in like manner the pages 2 7 4 5, whose heads lie in the opposite direction, will fall over the forms 1 8 3 6, respectively. Thus at each revolution of the type-cylinder 80 two complete eight-page newspapers are printed on the web with their heads lying in opposite directions, as illustrated in Fig. 8. In order to convert this web into what we may term "half-sheets," for it will take two of them to form a complete product, the cutting-cylinders 82 83 will be arranged to sever it upon the lines *a*, which will produce pairs of half-sheets A B and A A B B, and these have now to be properly collected in pairs of A B and A A B B, and then properly folded on the line *e*. To collect the half sheets of this web properly together it will be apparent that the half-sheet B must be brought under the half-sheet A and that the half-sheet B B must be brought over the half-sheet A A, and that the former pair must be folded upward and the latter downward, so as to bring the first page on the outside, and thus form a complete product or eight-page newspaper; and this operation of collecting and folding will now be described.

The printed and partially-severed web is carried forward by the tapes 48 49 of the pendulous conductor, and the oscillations of this conductor are so timed by the cams 69 70 that a half-sheet issues from the rollers 46 47 just as these rollers arrive over the rollers 2 3. They remain in this position long enough to allow the leading edge of the half sheet to enter between the rollers 2 3, which firmly nip it and continue to carry it forward. The pendulous conductor then moves over the rollers 6 7, as in Fig. 5, and the effect of this movement is to draw the tail end of the half-sheet out from between the tapes 48 49, which, as heretofore explained, are slightly separated at this point, and thus break loose the filaments that joined this half-sheet to the succeeding one, while this latter is yet held firmly between the tapes 48 49 by their pressure against the roller 45. The pendulous conductor remains over the rollers 6 7 long enough to enter the next half-sheet between them, and then returns to the rollers 2 3, and in so doing breaks this second half-sheet from the third one. It then enters this third half-sheet between the rollers 2 3, and is then carried to the rollers 4 5, breaking the fourth half sheet loose from the fifth and delivering it to these rollers, and so on, each alternate half-sheet being thus delivered through the central passage-way and the intervening half-sheets being delivered alternately through one of the auxiliary pathways.

The length of the circuit between the rollers 4 5 around the roller 14 to the nipping-point between the rollers 12 13 is adjusted so that the leading edge of the half-sheet which passes in that circuit or through that auxiliary pathway shall accurately meet the leading edge of the succeeding half-sheet which is fed between the rollers 2 3. The circuit of the opposite auxiliary pathway is in like manner adjusted, and the rollers 14 16 may be supported in adjustable bearings, as 94 95, to accomplish this result. The pairs of half-sheets which are thus brought together pass between the rollers 12 22 and the rollers 13 23. The pair of half-sheets which are collected by passing through the auxiliary pathway, the entrance of which is formed by the rollers 6 7, and through the central pathway, are folded between the rollers 12 22, and the succeeding pair of half-sheets collected through the pathway between the rollers 4 5 and through the central pathway are folded between the rollers 13 23, consecutive pairs being thus folded alternately in opposite directions.

The movements of the double-acting folding-blade 35, as imparted to it by its actuating-cams 64 65, are such that after it has moved, say, to the left and doubled a pair of half-sheets into the left-hand pair of folding-rollers, it withdraws a little, and then remains stationary while the next pair of half-sheets descends into position to be folded to the right of it, when it moves to the right and doubles this pair of half-sheets into the right-hand pair of folding-rollers, and then withdraws a little and remains stationary while the next pair of half-sheets descends into position to the left of it, when it again moves to the left, and so on.

Supposing the mechanisms to stand as is shown in Fig. 4 and the leading edge of sheet A to be entering the nip of the tapes 48 49 between the rollers 44 45, said sheet will be carried downward by said tapes during the time that the pendulous conductor is swinging to the position shown in Fig. 5 over the rollers 6 7, where they arrive and remain long enough for said sheet A to be entered into the auxiliary pathway, into which it will continue to run as the conductor swings and while the second half-sheet, B, is carried downward by the tapes 48 49, so that as the pendulous conductor swings into its position over the rollers 2 3 the tail of the first sheet will leave it and the head of the next sheet, B, will enter into the nip of the rollers 2 3, as in Fig. 4. The sheet A will be carried through the auxiliary pathway and travel a distance properly proportioned to cause its leading end to pass between the conductor 17 and roller 12 in proper time to cause it to meet and register with the leading edge of the sheet B, which descends between the rollers 2 3 and conductors 17 18, the leading edges of said sheets A and B being thus caused to exactly meet, so that the two will be simultaneously nipped by the rollers

12 13. While this operation is going on the third sheet, A A, will follow the sheet B in the pendulous conductor and the latter be swung in proper time over the rollers 4 5, as in Fig. 6, and deliver said sheet to the auxiliary pathway, which said rollers in part form. The fourth sheet, B B, which follows the sheet A A through the pendulous conductor, will be delivered by the swinging action of said conductor over the rollers 2 3 and into the nip thereof, so that while the sheet A A is making the circuit of the auxiliary pathway the said sheet B B will be timely fed through the rollers 2 3, so that the leading edges of the sheets A A and B B will meet and be nipped by the rollers 12 13 and be thereafter fed concertedly below the same. The first pair of associated sheets will descend from the rollers 12 13 on the left-hand side of the folding-blade 35 and be folded by the movement thereof into the nip of the rollers 12 22, as in Fig. 6, and be delivered therefrom during the time when the second pair of sheets are being associated, and the second pair of sheets will descend from the rollers 12 13 and depend therefrom on the right-hand side of the said folder 35, and be folded thereby through the rollers 13 23 during the time when the next succeeding set of sheets A B are being associated or collected, as in Fig. 5. As the first page of the one copy of this eight-page newspaper is on the lower part of the half-sheet A, and this half-sheet is next to the folding-rollers 12 22, between which it will be folded, as in Fig. 6, it follows that when so folded the first page will be on the outside, and that it will still be on the outside after having received a cross-fold from the blade 75 through the folding-rollers 50 51; and the first page of the other copy of this eight-page newspaper is on the lower part of the half-sheet A A, and is next to folding-rollers 13 23, between which it will be folded, as in Fig. 5; hence the first page will also be on the outside after the paper has received a first and second fold. This manipulation of the sheets may be varied by a simple change in the position of the cams, so that the associated pair of sheets, one of which passes in the channel or pathway around the roller 14, will be folded between the rollers 12 22 and the next succeeding pair of sheets through the rollers 13 23, if it is desired; but this will necessitate a slightly-different imposition of the pages of matter upon the type-cylinders, as will be readily understood by those skilled in this art.

The pendulous conductor may be a framework, and the rollers 44 45 be made to nip and drive the paper until it is seized by one set of rollers, 2 3, 4 5, or 6 7; or the cutting-cylinders 82 83 may be depended upon to accomplish this result.

Any other form of final folding device may supplant the blades 74 75 and their rollers.

The collected sheets emerging from the rollers 12 13 may be delivered to any other form of folding device or be piled flat.

The folding-rollers for the blade 35 may be independent of the rollers 12 13, if desired.

Two single-acting folding-blades may be substituted for the one double-acting blade.

What is claimed is—

1. A sheet-collecting apparatus consisting of a central or main pathway and two auxiliary pathways leading thereto, and a pendulous conductor and means for causing its alternate co-operation with the said pathways, whereby successive sheets are associated in pairs, all substantially as described.

2. The combination, with the central or main pathway, the two auxiliary pathways leading thereto, and pendulous conductor co-operating with said pathways, of a vibrating folding-blade and opposite pairs of folding-rollers, whereby successive sheets are associated in pairs and the sheets composing said pairs are folded and delivered in opposite directions, substantially as described.

3. The combination, with a printing-machine and cutting devices, of a pendulous conductor, a main pathway and two auxiliary pathways leading thereto, and means for causing the alternate co-operation of said conductor with said pathways, whereby a web is printed, severed into sheets, and said sheets are associated and delivered in pairs, all substantially as described.

4. The combination, with cutting devices, of a pendulous conductor, a main pathway and two auxiliary pathways leading thereto, means for causing the alternate co-operation of said conductor with said pathways, two sets of folding-rollers, and a vibrating folder co-operating therewith, whereby a web is severed into sheets and said sheets are collected in pairs that are folded and delivered alternately in opposite directions, all substantially as described.

5. The method of collecting succeeding sheets into pairs, the same consisting in causing the last sheet of each pair to be placed alternately to the right and to the left of the first sheet of such pairs, all substantially as described.

In testimony whereof we have hereunto set our hands, each in the presence of two subscribing witnesses.

EDWYN ANTHONY.
W. W. TAYLOR.

Witnesses to the signature of Edwyn Anthony:

T. H. PALMER,
H. T. MUNSON.

Witnesses to the signature of William Wilberforce Taylor:

HENRY H. SLATER,
Clk., Sharon Cottage, Ripon.
C. W. KENT,
Grammar School, Ripon.