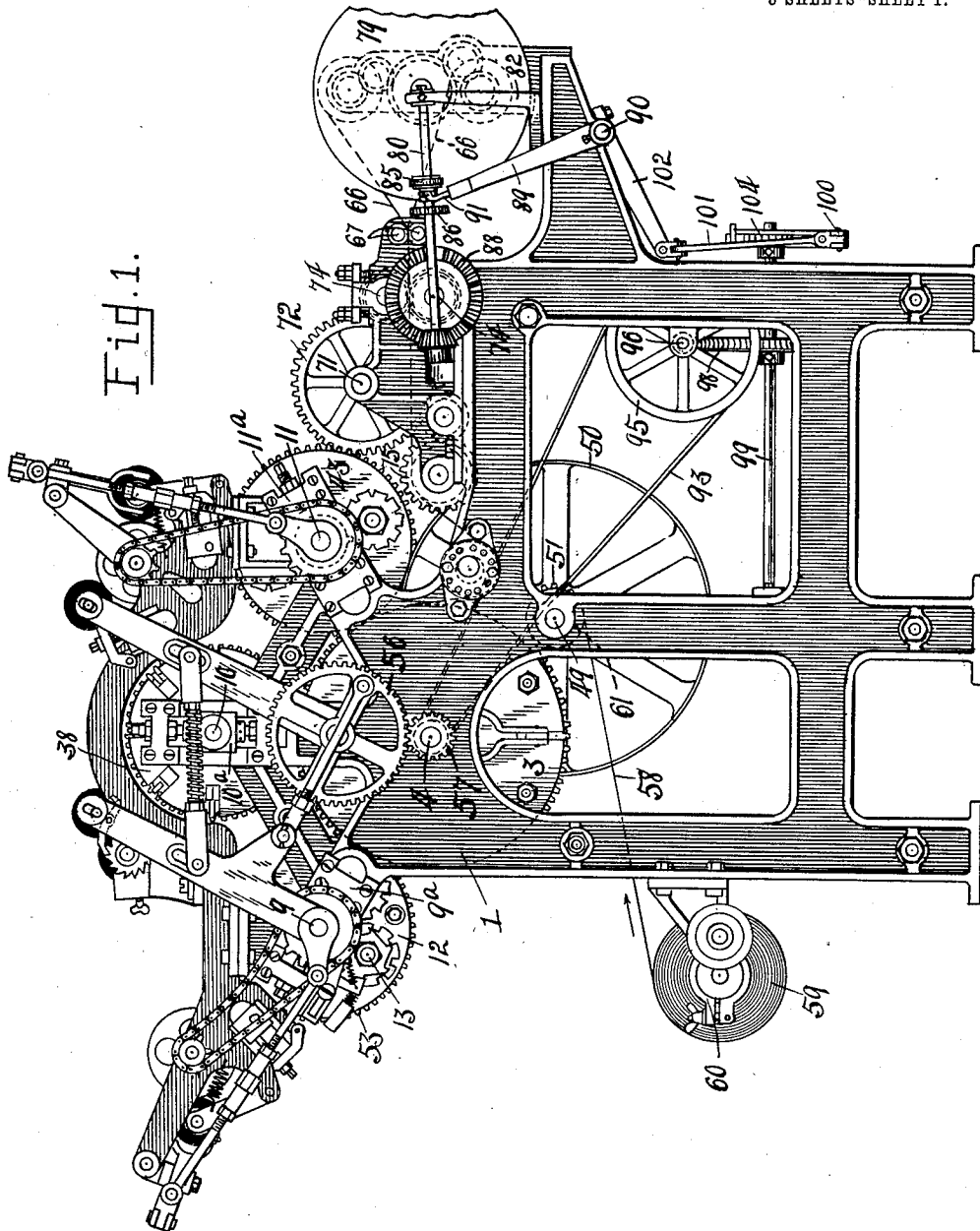


A. J. BOHNENGEL.
TAPE PRINTING MACHINE.
APPLICATION FILED JAN. 19, 1914.

1,100,284.

Patented June 16, 1914.

8 SHEETS-SHEET 1.



WITNESSES:
D. C. Walter
R. E. Allen.

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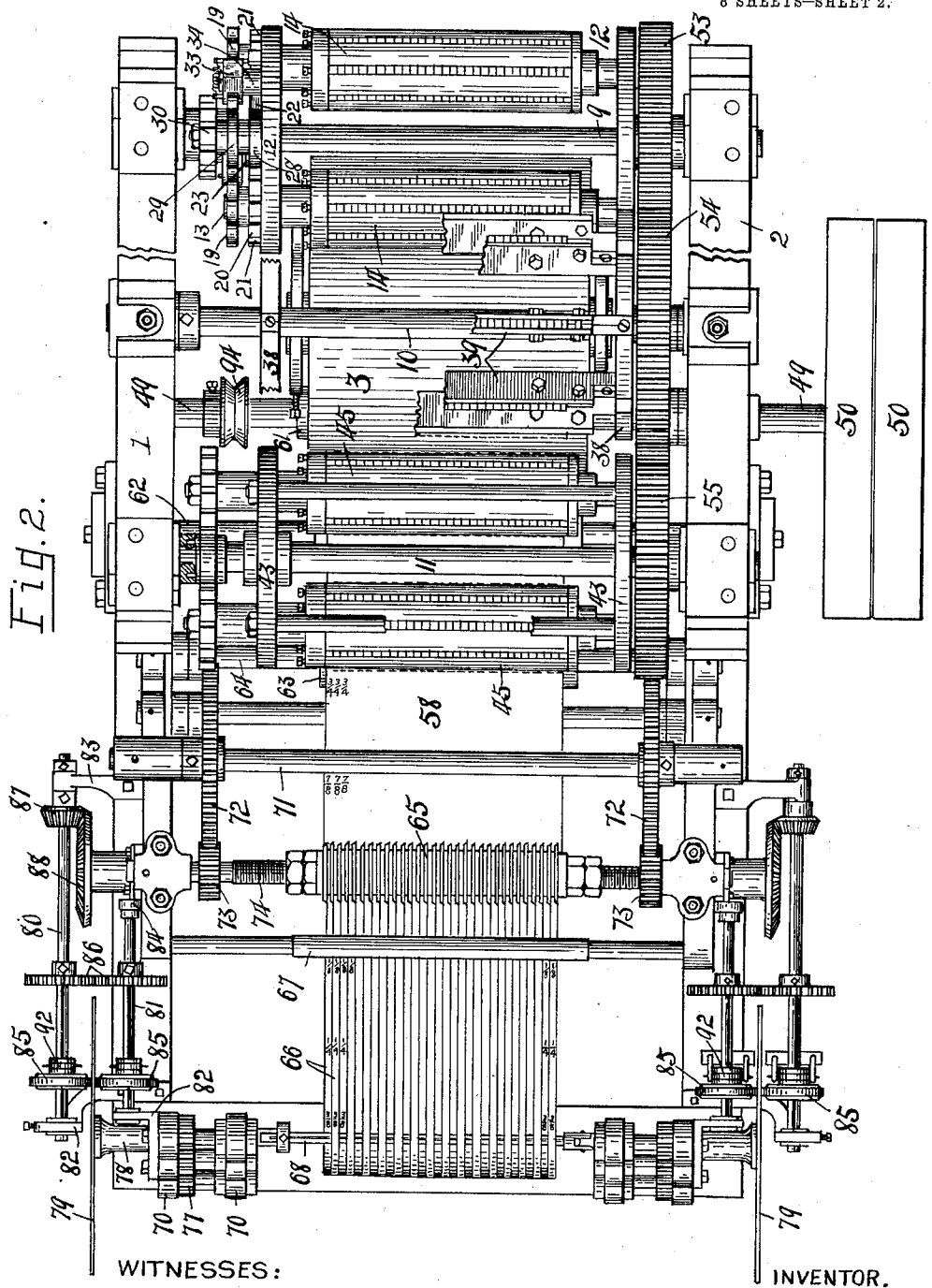


Fig. 2.

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8 SHEETS—SHEET 3.

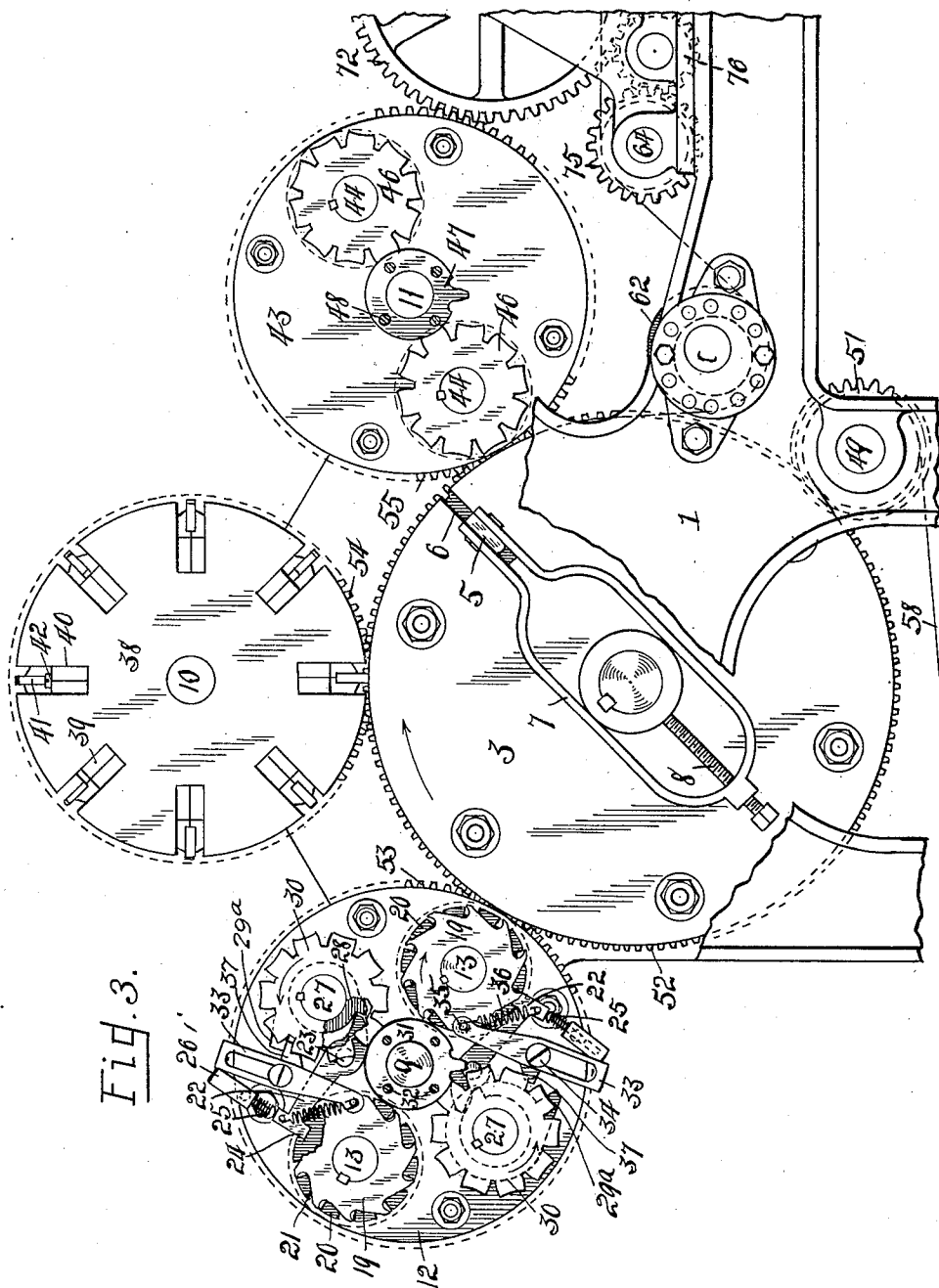


Fig. 3.

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1,100,284.

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8 SHEETS—SHEET 4.

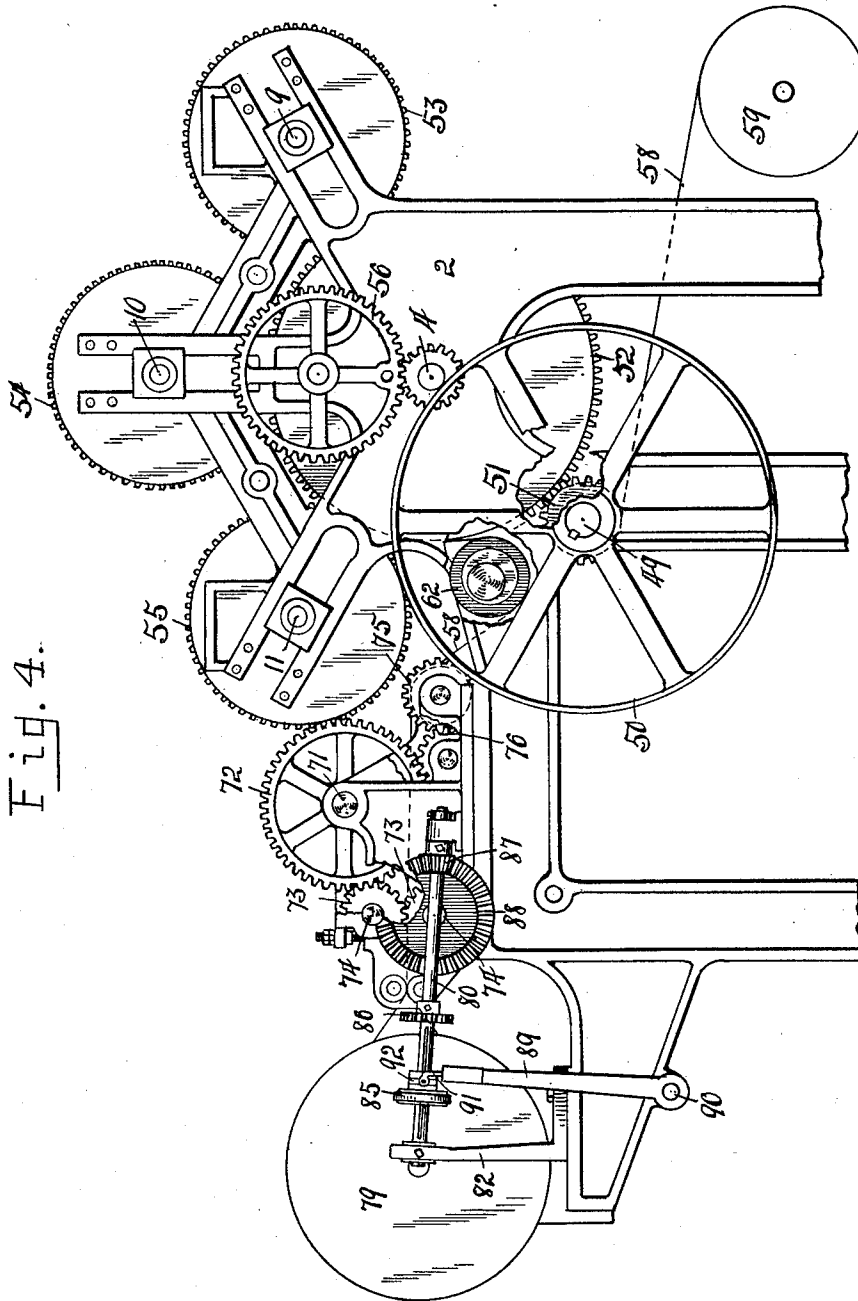


Fig. 4.

WITNESSES:
D. C. Walter
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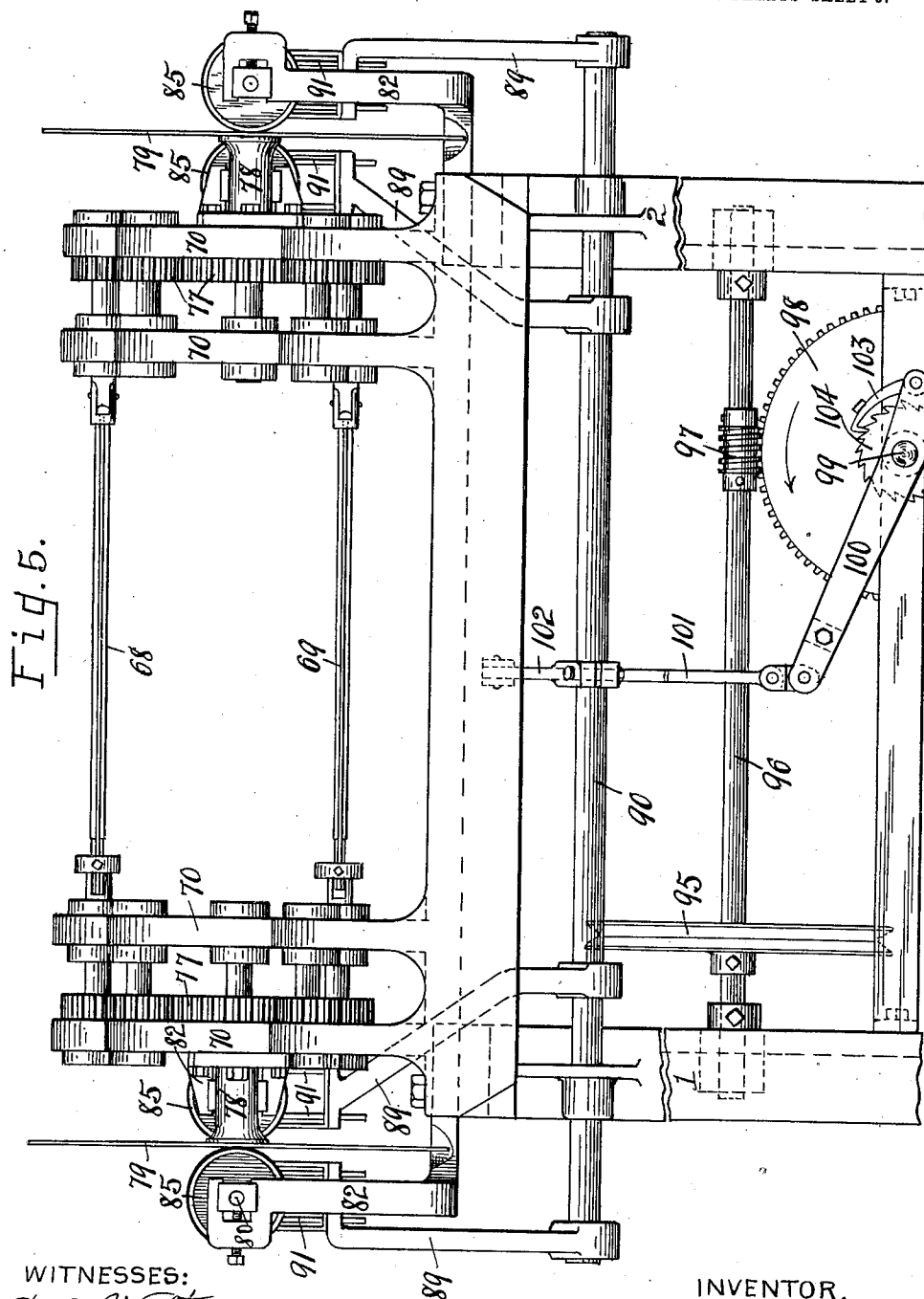
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APPLICATION FILED JAN. 19, 1914.

Patented June 16, 1914.

8 SHEETS—SHEET 5.



WITNESSES:
D. C. Walter
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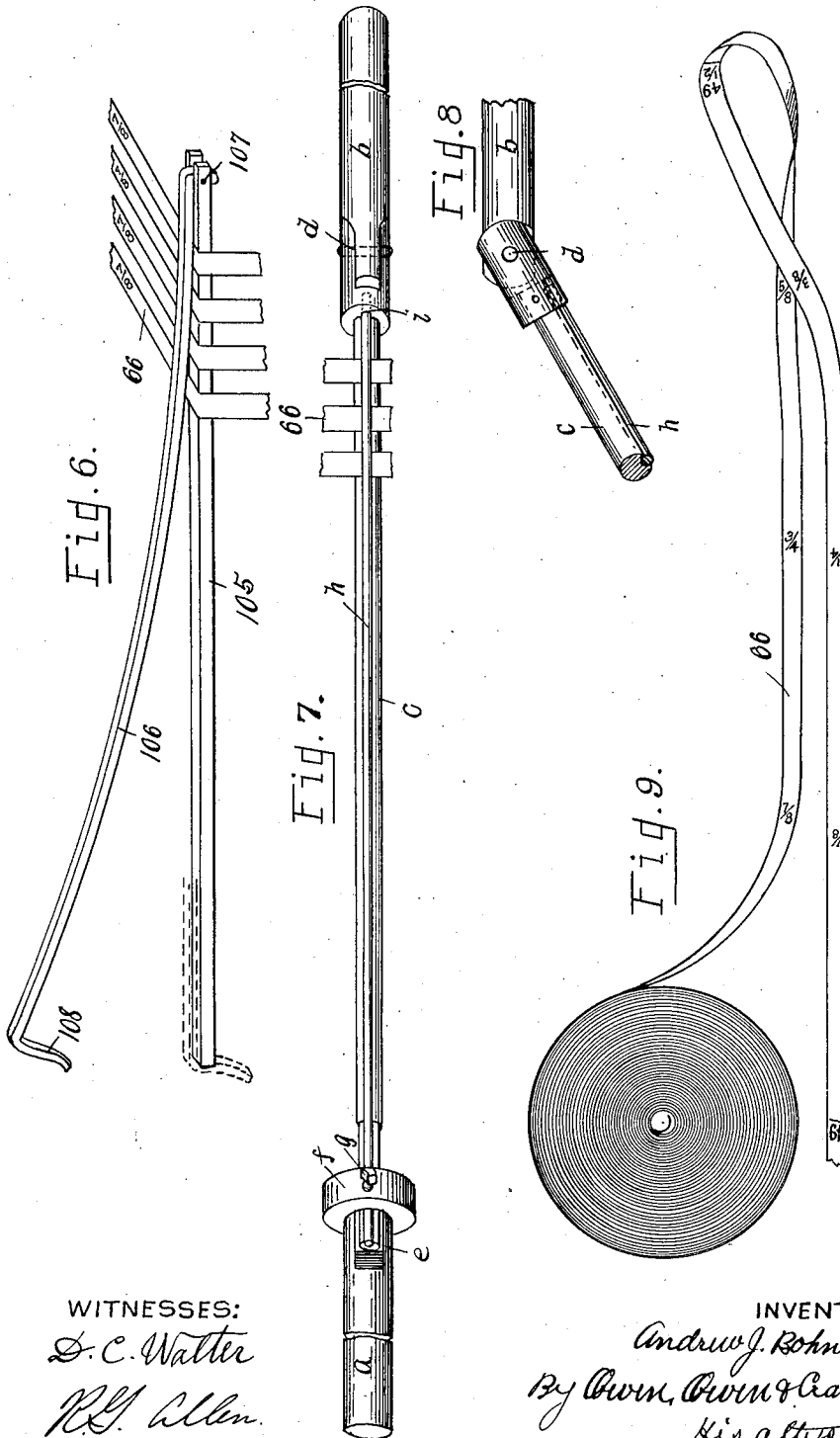
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TAPE PRINTING MACHINE.
APPLICATION FILED JAN. 19, 1914.

1,100,284.

Patented June 16, 1914.

8 SHEETS—SHEET 6.



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TAPE PRINTING MACHINE.
APPLICATION FILED JAN. 19, 1914.

Patented June 16, 1914.

8 SHEETS—SHEET 7.

Fig. 10.

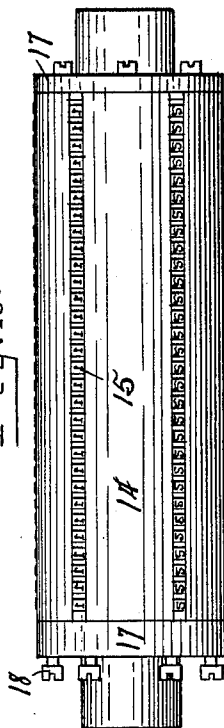
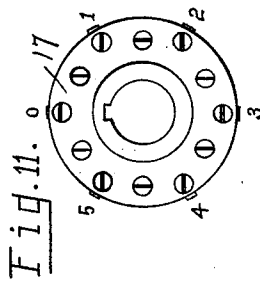


Fig. 12.

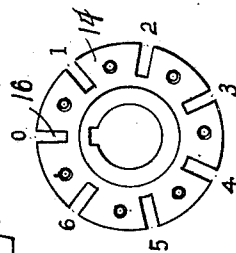


Fig. 13.

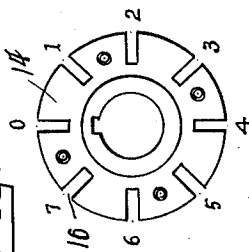


Fig. 14.

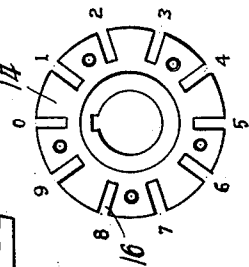


Fig. 15.

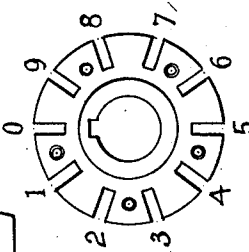


Fig. 16.

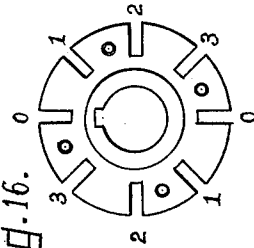
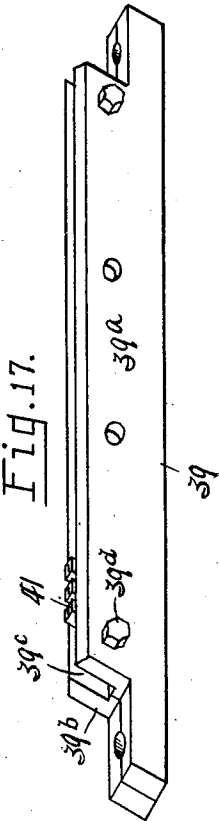


Fig. 17.



WITNESSES:

S. C. Walter
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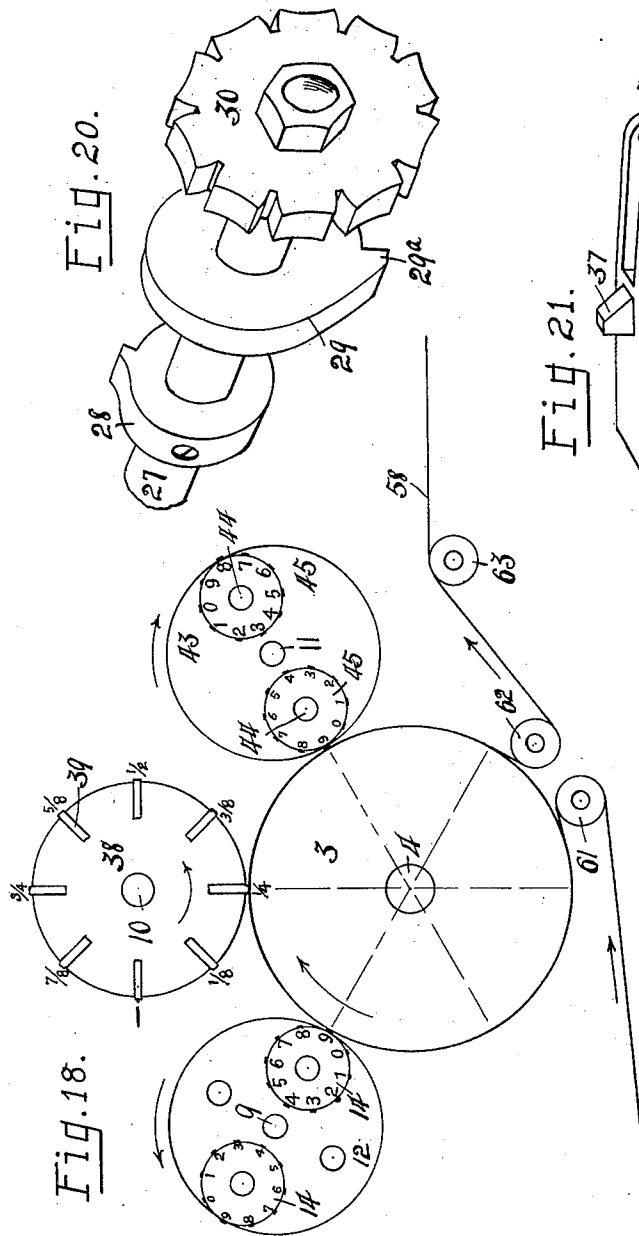
Andrew J. Bohnengel,
By *Wm. Owen Crawford*,
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A. J. BOHNENGEL.
TAPE PRINTING MACHINE.
APPLICATION FILED JAN. 19, 1914.

1,100,284.

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8 SHEETS—SHEET 8.



WITNESSES:
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UNITED STATES PATENT OFFICE.

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TAPE-PRINTING MACHINE.

1,100,284.

Specification of Letters Patent.

Patented June 16, 1914.

Application filed January 19, 1914. Serial No. 813,078.

To all whom it may concern:

Be it known that I, ANDREW J. BOHNENGEL, a citizen of the United States, and a resident of Toledo, in the county of Lucas and State of Ohio, have invented a certain new and useful Tape-Printing Machine; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the characters of reference marked thereon, which form a part of this specification.

This invention relates particularly to an apparatus for the printing of measuring tapes, or the like, but is not restricted to such use as it may be used in any connection for which it may be adapted or appropriate.

The object of my invention is the provision of an improved apparatus of this character, which is adapted to print one or more longitudinally extending rows of measurement figures or other designations on a strip of paper, cloth, or the like, as it is continuously fed through the apparatus, whereby to enhance the practicability and commercial value thereof.

A further object of the invention is the provision, in combination with a single impression cylinder, of a plurality of separate cylinders or printing means arranged around the cylinder and adapted to progressively act to print different measurements or other designations on a strip of cloth, paper, or the like, as it passes around the cylinder.

A further object of the invention is the provision of simple and improved means for controlling and imparting intermittent rotation to the "tens" cylinder or cylinders around their respective axes of rotation as the printing of numbers in proper order requires.

A further object of the invention is the provision of improved means of a simple and efficient character for driving a rewinding roll, whereby the speed of driving of the roll varies to compensate for the changing in size of its diameter as a strip winds on or from the same, so that the speed of movement of the strip is constant.

Further objects and advantages will be apparent from the following detailed description thereof.

The invention is fully described in the

following specification, and while, in its broader aspect, it is capable of embodiment in numerous forms, a preferred embodiment thereof is illustrated in the accompanying drawings, in which,—

Figure 1 is a right side elevation of a machine embodying my invention. Fig. 2 is a top plan view thereof with parts broken away and removed. Fig. 3 is an enlarged detail of the arrangement of the printing and impression cylinders and associated parts with a portion of the frame broken away. Fig. 4 is a left side elevation of the machine with parts broken away and removed. Fig. 5 is a front end elevation of the machine with the printing parts removed. Fig. 6 is a perspective view of a tape clamping member used in connection with the machine. Fig. 7 is a perspective view of one of the tape winding shafts. Fig. 8 is a detail of a portion thereof. Fig. 9 is a side elevation of a printed tape roll with a part unwound therefrom. Fig. 10 is a side view of one of the printing cylinders. Fig. 11 is an end view thereof. Figs. 12, 13, 14, 15 and 16 are end views of different tens cylinders for the printing of tapes of different lengths, with the type bars removed therefrom. Fig. 17 is a perspective view of one of the type bars of the fraction cylinder. Fig. 18 is a diagrammatic view of the printing and impression cylinders. Fig. 19 is a detail of a portion of a printed tape. Fig. 20 is a perspective view of a portion of the control mechanism employed in connection with each "tens" cylinder, and Fig. 21 is an enlarged perspective of one of the ratchet members used in connection with the "tens" cylinder.

Referring to the drawings, 1 and 2 designate the right and left sides, respectively, of the machine frame, and 3 the impression-cylinder of the printing mechanism, which cylinder is mounted on a shaft 4, the ends of which project through and are journaled in suitable bearings provided in the respective sides of the frame. The impression cloth, which customarily encircles the impression cylinder 3, is tightened thereon, in the present instance, by the provision of a bar 5, which is intended to extend through a looped portion of the cloth into a longitudinal recess 6 in the cylinder periphery. The bar 5 is engaged at each end by a yoke member 7 which straddles the shaft 4 or hub portion of the cylinder and carries an adjust-

able screw 8 at its opposite end to that engaging the bar 5 for bearing against the registering portion of the cylinder hub or shaft, the screw being adjustable relative to the yoke to impart radial movements to the bar 5, as desired (see Fig. 3.)

The shafts 9, 10 and 11 are disposed in spaced relation around the upper portion of the impression cylinder 3 in parallelism with its axis and mounted at their ends in suitable bearings provided in the frame ends for such purpose, such bearings, in the present instance, being radially adjustable with respect to the impression cylinder 3 and designated 9^a, 10^a and 11^a, respectively. The shafts 9 and 11, in the present instance, carry what may be termed the "tens" and "units" printing devices, respectively, and the shaft 10 carries the fraction printing device.

The "tens" printing device comprises a pair of spaced disks 12, 12, which are fixed to the shaft 9 and connected by diametrically opposed shafts 13, 13, which have their ends rotatably mounted in suitable bearing openings provided therefor in the respective disks 12, whereby such shafts are permitted to revolve about the shaft 9 when the disks are rotated and to have rotary movements about their own axes relative to the disks. Each shaft 13 has a printing cylinder 14 fixed thereto intermediate the disks 12, 12. Each cylinder 14, in the present instance, is provided with a plurality of circumferentially-extending rows of figures, with the figures of each row running in consecutive order from naught to any desired number depending upon the length of the tape to be printed, and with the like designations extending in rows longitudinally of the cylinder, as shown in Fig. 10. The longitudinally-extending rows of figures, which are designated 15, are secured in longitudinal surface recesses or grooves 16 in the cylinders and may be of cast bar form or composed of a plurality of individual type, as desired. The cylinders 14 are provided at their ends with collars 17 which close the ends of the grooves, one collar of the cylinder forming a rigid abutment for the adjacent ends of the type bars 15 and the other collar carrying set-screws 18 in register with the adjacent ends of respective grooves for tightening against the type bars to firmly secure them within the grooves. The type bars of each cylinder are equidistantly spaced therearound, the spacing between adjacent bars depending upon the number of bars employed.

A number of the "tens" cylinders 14 are provided for use with a machine to enable tapes of different lengths to be printed. For instance, if sixty yard tapes are to be printed a cylinder 14 with six type bars, as shown in Fig. 11, is mounted on each of the

shafts 13. The cylinders shown in Figs. 12, 13 and 14 are adapted for the printing of seventy, eighty and one hundred yard tapes, if the yard is taken as the unit of measurement. If desired, more than one set of "tens" designations may be provided on a single cylinder, as for instance, should it be desired to print tapes of forty yards measurement an eight groove cylinder is used and two sets of type bars, each running from naught to three, is provided thereon, as shown in Fig. 16, thus adapting a single complete rotation of the cylinder to print two forty yard lengths of tape.

When the unit of measurement of the tape or tapes being printed is a yard, the distance of travel of the outer edge of each cylinder 14, in making a complete revolution about the axis 9, is one yard, and one of the cylinders 14 is intended to print the "tens" designations for the full yards and the other the "tens" designations for the half yards, the printing points of the two cylinders being spaced one-half yard apart circumferentially of the disks 12 for such purpose.

The means employed to successively rotate each cylinder 14 about its axis 13 at each tenth revolution of the cylinder about the axis 9 to successively place the type bars of the cylinders in printing position, will now be described and is shown in Figs. 2, 3, 20 and 21. On the end of each shaft 13 without the right disk 12, in the present instance, are fixedly mounted a ratchet-wheel 19 and a lock-wheel 20, the latter having a plurality of equidistantly spaced peripheral notches 21 corresponding in number to the teeth of the ratchet-wheel 19 and to the number of type bars 15 carried by the cylinder 14, which is mounted on the shaft therewith. A lever 22 is pivoted to the disk 12 adjacent to the associated wheel 20, as at 23, and has one end provided with a tooth or lateral projection 24 for engaging into a registering notch 21 in the wheel 20. A spring-pressed plunger 25 acts against the toothed end of the lever 22 to urge it against the wheel 20, and such plunger is carried in the present instance, by a part 26 which is in turn carried by the disk 12 in outwardly spaced relation thereto. The engaging of the lever tooth 24 within a notch of the wheel 20 locks such wheel against turning relative to the disk 12. A pair of stub-shafts 27 rotatably project outwardly from the disk 12 in parallelism with and at opposite sides of its axis, and each fixedly carries a cam-wheel 28, a single toothed wiper-wheel 29 and a gear 30, of the Geneva type, arranged, in the present instance, outwardly from the disk in the order given.

Each of the Geneva gears 30 has ten teeth and at each complete rotation of the disk 12 has a tenth of a rotation imparted thereto

by a single toothed gear 31, which is loosely mounted on the shaft 9 and is anchored to the adjacent frame side 1 of the machine by pins 32. The cam wheel 28 is disposed in the plane of the end of the lever 22, which is opposed to the toothed end thereof, and at a predetermined point in each complete rotation of the wheel about its axis is intended to act on and effect a rocking of the lever 22 to retract its toothed end from locking engagement with the associated wheel 20.

A pawl member 33 is mounted for rocking and longitudinal reciprocatory movements on a pin or stud 34 projecting from the disk 12 intermediate the shafts 13 and 27 of each control set, and has its inner end forked (see Fig. 21) to adapt it to straddle the associated ratchet wheel 19, and such forked end is provided with a cross pin 35 for engaging the teeth of the ratchet wheel. The pawl 33 is yieldingly held at the limit of its outward longitudinal reciprocatory movement by a spring 36, which connects the inner end of the pawl to the outer end portion of the associated lock-lever 22. The pawl 33 is provided with a tooth 37 on the side thereof adjacent to the associated wiper-wheel 29 in the path of movement of a tooth 29^a on such wiper-wheel, whereby an inward ratchet-wheel actuating movement is imparted to the pawl at each revolution of the wiper tooth. When the tooth 29^a has turned a predetermined distance in engagement with the pawl tooth 37 the teeth will slip from engagement and the pawl is then retracted by the spring 36 in position to engage a succeeding tooth of the ratchet wheel 19. The engagement of the projection on the cam wheel 28 with the inner end of the lever 22 is timed to take place just prior to the engaging and moving of the pawl by the wiper tooth 29^a, so that the outer end of the lever will be retracted from locking engagement with the wheel 20 at the time of movement of the pawl and consequent movement of the ratchet-wheel 19, shaft 13 and lock-wheel 20. The cam 28 releases the lever 22 shortly after the engaging of the wiper-tooth 29^a with the pawl tooth so that the outer end of the lever is free to move into locking engagement with the next recess 21 in the wheel 20 when such recess moves into register therewith.

It is evident from the above that the stub shafts 27 and the parts carried thereby have one-tenth of a revolution imparted thereto at each complete rotation of the disks 12, 12 due to the single tooth stationary gear 31 coacting with the gear 30, and that at each tenth revolution of such disk the associated lever 22 is moved to release its locking engagement with the wheel 20 and the pawl 33 is moved to impart a predetermined distance of rotation to the associated ratchet-

wheel 19, shaft 13 and the printing cylinder carried thereby, thus moving the next type bar in order on the cylinder to printing position.

The fraction printing cylinder of the machine is carried, in the present instance, by the shaft 10 and is shown as comprising two disks 38, 38, which are fixedly mounted on said shaft and are connected at their outer edges at equidistantly spaced intervals circumferentially therearound by clamp-bars 39, the ends of which seat in registering recesses 40 in the respective disks. The purpose of the clamp-bars 39 is to hold the type-bars or lines of type 41, which bear the fractional designations to be printed on the strips intermediate the designations thereon which represent the full yards or other units of measurement. The type-bars, in the present instance, are eight in number, being one-eighth of a yard apart, and bear fractions for the successive eighths of a yard, with the bar which registers with the full yard designations provided with a straight line, as indicated at *a* in Fig. 19, for underlining the full yard designations, as shown in diagrammatic form in Fig. 18. The bar bearing the half yard designations also underlines such designations, as indicated at *b* in Fig. 19.

Each of the clamp-bars 39, one of which is shown in detail in Fig. 17, comprises, in the present instance, two opposing clamping members 39^a and 39^b forming a recess 39^c between their upper edge portions for receiving and clamping the type bar 41 or the individual type forming the same. The members of the clamp bars are drawn together by screws 39^d or in any other suitable manner. The clamp bars are secured at their ends to the respective disks 38 by screws 42 (Fig. 3) or in any other suitable manner. The shaft 11 is intended to carry the "units" printing device, which device comprises, in the present instance, the two disks 43, 43, which are mounted in spaced relation on said shaft and carry the two shafts 44, 44 at opposite sides of the shaft 11, the shafts 44 having their ends suitably journaled in the respective disks for free turning movements relative thereto. A cylinder or type drum 45 is carried by each shaft 44 intermediate the disks and is provided circumferentially therearound with a plurality of rows of unit designations running from 0 to 9, as best shown in Figs. 15 and 18. The construction of the cylinders 45 and the manner of arrangement and securing thereto of the type-bars bearing the like unit designations is the same, or similar, to that described for the "tens" cylinders 14 and need not therefore be further described. The only difference between the cylinders 14 and 45 is that the number of longitudinally-extending rows of designa-

tions on the "tens" cylinders varies for the length of the tape strips to be printed, while the longitudinally-extending rows of designations on the "units" cylinders remain constant. Inasmuch as the unit designations are printed at the sides of the "tens" designations it will be understood that the circumferential rows of unit designations are offset axially of the cylinders a sufficient distance relative to the circumferential rows of "tens" designations for such purpose.

In order to impart a tenth of a rotation to each cylinder 45 at each revolution of the same about the shaft 11, a Geneva type of gear 46 is mounted on one end of each shaft 44 without the adjacent disk 43, and a tooth thereof is engaged at each revolution by a single toothed gear 47, which loosely encircles the shaft 11 and is fixed against turning by pins 48, which anchor the same to the adjacent side of the machine frame, both the gear 47 and the corresponding gear 35 of the "tens" printing device coacting with a registering tooth on the respective gears 46 and 30 to prevent rotation of the latter except when the single tooth of the drive gear moves into mesh therewith, as will be understood by reference to Fig. 3.

The main drive shaft 49 of the machine is journaled at its ends in suitable bearings in the frame sides and carries at one end without the frame a pair of pulleys 50, 50, one of which is loose thereon, to facilitate a driving of the machine. The shaft 49 also carries a small gear 51, which meshes with and drives a large gear 52 on the shaft 4 with the impression cylinder. The gear 52 in turn meshes with and drives each of the gears 53, 54 and 55, which are fixed respectively to the adjacent ends of the shafts 9, 10 and 11. The gears 53, 54 and 55 are of like size so that the respective tens, fraction and units printing cylinders or devices are rotated together at uniform speed.

The inking mechanism for the several printing cylinders or devices is connected to and actuated by the rotation of a gear 56 at each side of the frame, such gears meshing with and being driven by small gears 57 on the outer ends of the shaft 4. The inking mechanism is shown in side elevation in Fig. 1, but as the same forms no part of the present invention, it will not be specifically described. It will be understood that any suitable or convenient mechanism for distributing ink to the respective printing parts may be used as desired.

The paper or other material to be printed is designated 58 and feeds from a roll 59, which is mounted, in the present instance, at the rear end of the machine within convenient reach of the operator. Any suitable tension means, such for instance, as indicated at 60, may be provided for preventing a too free turning of the material roll, as is

well understood in the art. The material strip 58 after leaving its roll extends forward therefrom around an idler roll 61 on the shaft 49 and thence passes rearward and upward around the impression-cylinder 3, and passes therefrom under an idler roll 62, which is disposed below the "units" printing device in advance of the impression cylinder and is journaled at its ends in suitable bearings in the frame sides.

The material strip 58 after leaving the idler roll 62 passes over a feed-roll 63, the shaft 64 of which is journaled at its ends in the frame sides, the strip thence passing forward between opposing sets of rotary slitting knives 65 by which it is slit longitudinally into a plurality of tape strips 66 corresponding in number to the number of circumferential rows of measurement designations on the printing cylinders, each tape strip bearing the desired measurement designations. The tape strips 66 after emerging from the slitting means pass between a pair of idler or guide rolls 67, and thence alternately wind upon upper and lower tape winding shafts 68 and 69, respectively, which are journaled at their ends in upright frame parts 70, 70 at the forward end of the main frame of the machine. The alternate winding of the tapes 66 on the shafts 68 and 69, which is shown in Figs. 1 and 2, enables the tapes to be wound in rolls which do not interfere one with the other, and makes such winding practical.

The tape winding shafts 68 and 69 are of like construction, a detail of one of the same being shown in Figs. 6 and 8. This shaft comprises opposite end members or journal parts *a* and *b*, which journal in the standards 70, 70 at the respective sides of the frame, and the journal part *b* has a section *c* hinged to its inner end, as at *d*, for lateral swinging movements and capable of extending axially therefrom and fitting at its opposite end into a side recess *e* in the inner end of the journal part *a*, such recess being of sufficient depth to permit the placing of the free end of the shaft parts *c* in axial register with the part *a*. A collar *f* is mounted on the part *a* for axial shifting movements over the recess *e* and carries a set-screw *g*, which, when the free end of the shaft section *c* is disposed within the recess *e*, is adapted to be tightened against such end to rigidly secure the sections *a* and *c* together. The shaft section *c* is provided in one side longitudinally thereof with a recess in which a bar *h* is intended to seat to clamp interposed tape strips to the shaft. One end of the bar *h* is removably inserted into a registering socket *i* in the enlarged inner end portion of the section *c*, and the other end of the bar is intended to be firmly held to the section *c* by the clamping action of the collar *f* and screw *g*.

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A shaft 71 extends across the upper portion of the machine in advance of the "units" printing cylinder and carries a gear 72 adjacent to each end thereof in mesh with pairs of gears 73, 73 on the ends of the shafts 74, 74 carrying the cutter disks 65, as best shown in Figs. 2 and 4. The gears 73, 73 are of like size and mesh with each other to drive the shafts 74, 74 in reverse directions at the same speeds. One of the gears 72 meshes with and is driven by the gear 55 on the shaft 11. The gear 72 also drives a gear 75 on the shaft 64 through the medium of a pinion 76.

The shafts 68 and 69 are geared together at each end by a train of gears 74, whereby such shafts are caused to have like rotation in unison, and one of the gears of each train has its shaft 78 extended outward from the respective frame part 70 and carrying a friction disk 79 at its outer end. A pair of shafts 80 and 81 extend in horizontally spaced parallel relation longitudinally of the forward end portion of the machine frame at each side thereof with their forward ends disposed at opposite sides of the associated disk 79, substantially in radial planes thereof, and journaled in respective brackets 82, which extend from adjacent frame parts, as best shown in Figs. 1, 2, 4 and 5. The rear end of the shaft 80, which is the outer one of the pair, is disposed in diametric relation to the lower shaft 74 and is journaled at the rear of such shaft in a bracket arm 83 projecting from the adjacent frame side. The inner shaft 81 terminates short of the shaft 74 and is journaled at its rear end in a bearing bracket 84. One of a pair of friction-wheels 85, 85 is feathered to each of the shafts 80—81, such wheels being adapted to frictionally bear in opposing relation against opposite sides of the associated disk 79 and to have movements radially thereof on the respective disks. The shafts 80 and 81 are geared together as by a pair of gears 86 to cause them to rotate in unison at like speeds, and the shaft 80 has a bevel-gear 87 fixed thereto and in mesh with a larger bevel-gear 88 on the adjacent end of the lower shaft 74. It is thus evident that the lower shaft 74 has like frictional driving connection with each train of gears 77.

Each friction wheel 85 is connected by a respective shipper arm 89 to a rock-shaft 90, which is mounted in suitable bearings transversely of the machine frame, whereby a rocking movement of such shaft will impart axial shifting movements in unison to the several friction wheels 85. Each shipper-arm is provided at its outer end with a longitudinally movable fork part 91, which straddles the hub portion of the respective friction wheel 85 and has its furcations pivoted to a collar 92, which loosely

fits within an annular groove in the wheel hub. The relative longitudinal movements of the two parts 89 and 91 of the wheel shifting arms permits such arms to lengthen and shorten as the arms are rocked so that the part 91 may have movement in the plane of shifting movement of the wheel 85. The shifting of the friction wheels 85 relative to the respective disks 79 is for the purpose of compensating for the gradually increasing diameters of the tape rolls as the tapes wind on the shafts 68 and 69, so that the speed of winding of such tapes will be uniform with the feed of the material strip 58 through the machine.

The means employed, in the present instance, for imparting the requisite rocking movements to the shaft 90 whereby the shifting of the wheels 85 is controlled to suit the winding of the tapes is driven from the shaft 4 by a belt 93, which connects a small pulley 94 on such shaft with a larger pulley 95 on a shaft 96, which is mounted transversely of the machine frame in suitable bearings provided therein, as shown. This shaft has a worm 97 thereon which meshes with and drives a worm-wheel 98 that is mounted on a shaft 99, which is journaled longitudinally of the machine frame in suitable bearings provided therein. A lever 100 is loosely mounted for rocking movements on the shaft 99 and has one end connected by a rod or link member 101 to an arm 102 projecting from the shaft 90, whereby rocking movements are imparted to the shaft 90 from rocking movements of the lever 100. The end of the lever 100 opposed to that to which the rod 101 is connected carries a pawl 103, which has hooked engagement with a ratchet-wheel 104 on the shaft 99, whereby a rotation of the shaft 99 in the direction of the arrow in Fig. 5 will cause an upward rocking movement to be imparted to the pawl carrying end of the lever. It is thus evident that a driving of the worm-wheel 98 will cause the friction-wheels 85 to be moved slowly outward from the centers of the disks 79 so that the speed of driving of the disks and consequently the tape winding shafts 68 and 69 will be slowly decreased as the tapes wind on said shafts.

When tape strips of desired lengths have been wound on the respective shafts 68 and 69 the tapes are severed between such shafts and the idler roll 67, and in order to retain the feeding ends of the tape strips which are adjacent to said rolls in properly spaced relation after the severing of the same, an auxiliary clamp is provided for such purpose. This clamp comprises a substantially rigid bar 105 of a length sufficient to reach across all of the tapes, and has a clamping member 106 pivoted to one end thereof, as at 107, and having its other end angled, as at

108, to adapt it to coact with the free end of the bar 105 to yielding hold the bars in clamped relation. The member 106 is preferably made of spring metal and normally bowed slightly outward from the bar 105 to adapt it to have a binding action against such bar when its end is drawn thereto.

The operation of my invention is as follows: A roll of sheet material 58, such for instance, as paper, cloth, or the like, having been mounted on its carrying roll, the sheet is passed forward therefrom around the idler roll 61, thence rearward and upward around the impression-cylinder 3 and down under the idler-roll 62 in advance of such cylinder, thence over the end roll 63, and forward therefrom between the slitting knives 65 and guide rolls 67, after which the tapes which are formed by the severing action of the knives 65, alternately wind around the winding shafts 68 and 69. If the tapes are to be run in, say, sixty yard lengths, the "tens" printing device is provided with cylinders 14 each having six type-bars 15 mounted thereon, such type-bars running from 0 to 5, consecutively, as shown in Figs. 10 and 11.

The tape strips are intended to be printed backward so that when wound the measurement designations will run inwardly of the rolls. Therefore when the machine is started the fraction cylinder, which is mounted on the shaft 10, will first act on the tape to print the $\frac{1}{8}$, $\frac{1}{4}$ and $\frac{5}{8}$ designations in the order given, being one-eighth of a yard apart on the sheet 58 in a plurality of rows disposed side by side and running lengthwise of the sheet, the spacing of the rows being equal to the desired width of the tape strips when cut. One of the "tens" cylinders, which is properly set for the purpose, will then have moved into position to print the 5 designations in the "tens" position on each row on the sheet, and as the half yard mark passes the fraction cylinder the designation $\frac{1}{2}$ with a line under it will be printed under the 5. The unit 9 will be affixed to the 5 designation by one of the "unit" cylinders 45, thus completing the 59½ designation for each roll at the half yard point thereon. After the printing of the half yard mark the fraction cylinder operates to print the $\frac{3}{8}$, $\frac{1}{4}$ and $\frac{1}{8}$ designations in proper order in the respective rows, and the other cylinder 14 of the pair, or that intended to print the full yard designations, acts on the sheet to print the fives in the "tens" column of the respective rows at the full yard point thereon. The full yard designation 59 for each row is then completed by the fraction cylinder printing the underline α and one of the "units" cylinders 45 affixing the unit 9 to the 5. It will be understood that this operation is repeat-

ed for each yard and that when the unit yards are being designated the naught designation is printed by the "tens" cylinders before each of the unit designations. In order that the designations for the full yards or other units of measurement may stand out more prominently than the half yard designations the type on the cylinders 14 and 45, which are intended to print the full yard designations, are of a larger or bolder face character than the type on the cylinders 14 and 45 which print the half yard designations, as illustrated in Fig. 18, and also on the tape shown in Fig. 19. It will be understood that each of the "units" cylinders 45, 45 has one-tenth of a rotation imparted thereto at each complete revolution thereof about the shaft 11, due to the coaction of the stationary single tooth gear 47 with one of the teeth on the Geneva gear 46, which is carried by the cylinder shaft, and that the cylinder is prevented from turning on its axis of rotation intermediate the point of engagement of the tooth of the gear 47 therewith by the coaction of the peripheral surfaces of the gears as shown. The action of the "tens" cylinders is different from the "units" cylinders, however, as such cylinders are intended to be given intermittent rotation on their respective axes at each tenth revolution of the same about the axis 9. This is accomplished by imparting a tenth of a rotation to each of the shafts 27, 27 at each revolution of the same about the axis 9 in the same manner that the unit cylinders are driven, and at a complete rotation of each shaft 27 the associated lever 22 is acted on by the cam 28 to release its locking engagement with the associated toothed wheel 20, which is mounted on the cylinder shaft, and at approximately the same time the wiper tooth 29^a engages and moves the pawl 33 to impart a sufficient movement to the ratchet-wheel 19 and associated cylinder 14 to place the next longitudinally-extending row of designations thereon in printing position. When the cylinder has been moved in this manner the requisite distance the lever 22 moves into locking engagement with the next recess in the wheel 20, and the pawl 33 is retracted in position to engage the next tooth of the ratchet-wheel. As the tapes wind upon the respective shafts 68 and 69 the friction drive wheels 85 are automatically moved radially of the friction disks 79 to cause a gradual slowing up of the speed of driving of the tape winding shafts to compensate for the gradually increasing diameters of the tape rolls so that the speed of winding or taking-up of the tapes will be the same as the speed of feeding of the sheet 58 through the machine.

It is evident that while I have particularly designated and shown the yard as the

unit of measurement which the machine is adapted to print, it will be understood that any other unit of measurement may be printed by changing the circumferential length of the "tens", "units" and fraction printing devices to correspond to the unit of measurement desired. I also wish it understood that my invention is not limited to any specific construction or arrangement of the parts as numerous modifications and changes may be made without departing from the spirit thereof.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is,—

1. In a machine of the class described, rotatable means, a printing member rotatably carried by said means for revoluble movements therewith about its axis, a control means rotatably carried by said first means, means operable to intermittently rotate said control means as it revolves about the axis of the rotatable means, means normally locking said printing member against rotation and released by said control means at a predetermined revolution of each successive set of revolutions of the printing member on its axis of revolution, and pawl and ratchet means operable at predetermined intervals during a rotation of said control means to impart predetermined intermittent rotation to said printing member.

2. In combination, a printing member, means carrying said member for rotary movements relative thereto and revoluble movements therewith, a ratchet wheel and a lock wheel connected to and rotatable with said member, control means carried by said first means for rotation relative thereto and revoluble movements therewith, means for imparting predetermined intermittent rotation to said control means as it revolves about the axis of said first means, a member normally engaging said lock-wheel to prevent rotation thereof and released therefrom by said control means at a predetermined point in a rotation of said means, and a pawl member actuated by said control means at a predetermined point in its rotation to impart intermittent rotation to the ratchet-wheel.

3. In combination, rotatable means, a printing cylinder having a plurality of circumferentially spaced printing parts thereon and carried for rotary movements by said means and for revoluble movements about its axis, a ratchet-wheel fixedly connected to said cylinder and having a number of teeth corresponding to the number of printing parts on the cylinder, a pawl mov-

ably carried by said means for engagement with successive teeth of the ratchet-wheel, and means operable to cooperate with said pawl at each of spaced predetermined revolutions of said printing cylinder about the axis of said rotatable means to rotate said cylinder to bring the next printing part in order in printing position.

4. In combination, rotatable means, a printing cylinder carried by said means and having a plurality of circumferentially spaced printing parts, a ratchet-wheel fixedly connected to said cylinder and having a number of teeth to correspond with the number of said printing parts, rotatable control means carried by said first means, means for imparting a partial rotation to said control means at each complete rotation of said rotatable means, a pawl actuated at a predetermined point in a rotation of said control means to rotate the ratchet wheel and cylinder a distance equal to the length of the space between adjoining printing parts on the latter, and mechanism normally locking the cylinder against rotation and actuated by said control means to release the cylinder during the shifting movements thereof.

5. In combination, rotatable means, a printing cylinder rotatably carried by said means for revoluble movements about its axis and having a plurality of circumferentially spaced printing parts, a peripherally notched wheel and a ratchet-wheel fixedly connected to said cylinder and having their respective notches and teeth corresponding to the number of printing parts on said cylinder, a member normally coacting with said lock wheel to prevent rotation thereof, a pawl coacting with and movable to impart step by step rotation to said ratchet wheel, a cam wheel and a wiper wheel rotatably carried by said first means, the former being operable at a predetermined point in a rotation thereof to move said member to release the lock wheel, and the wiper wheel being operable at a predetermined point in a rotation thereof to actuate said pawl to move said ratchet wheel, and means operable to impart intermittent rotation to said cam and wiper wheels as said rotatable means is rotated.

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

ANDREW J. BOHNENGEL.

Witnesses:

S. T. KLOTZ,
F. E. AUL.