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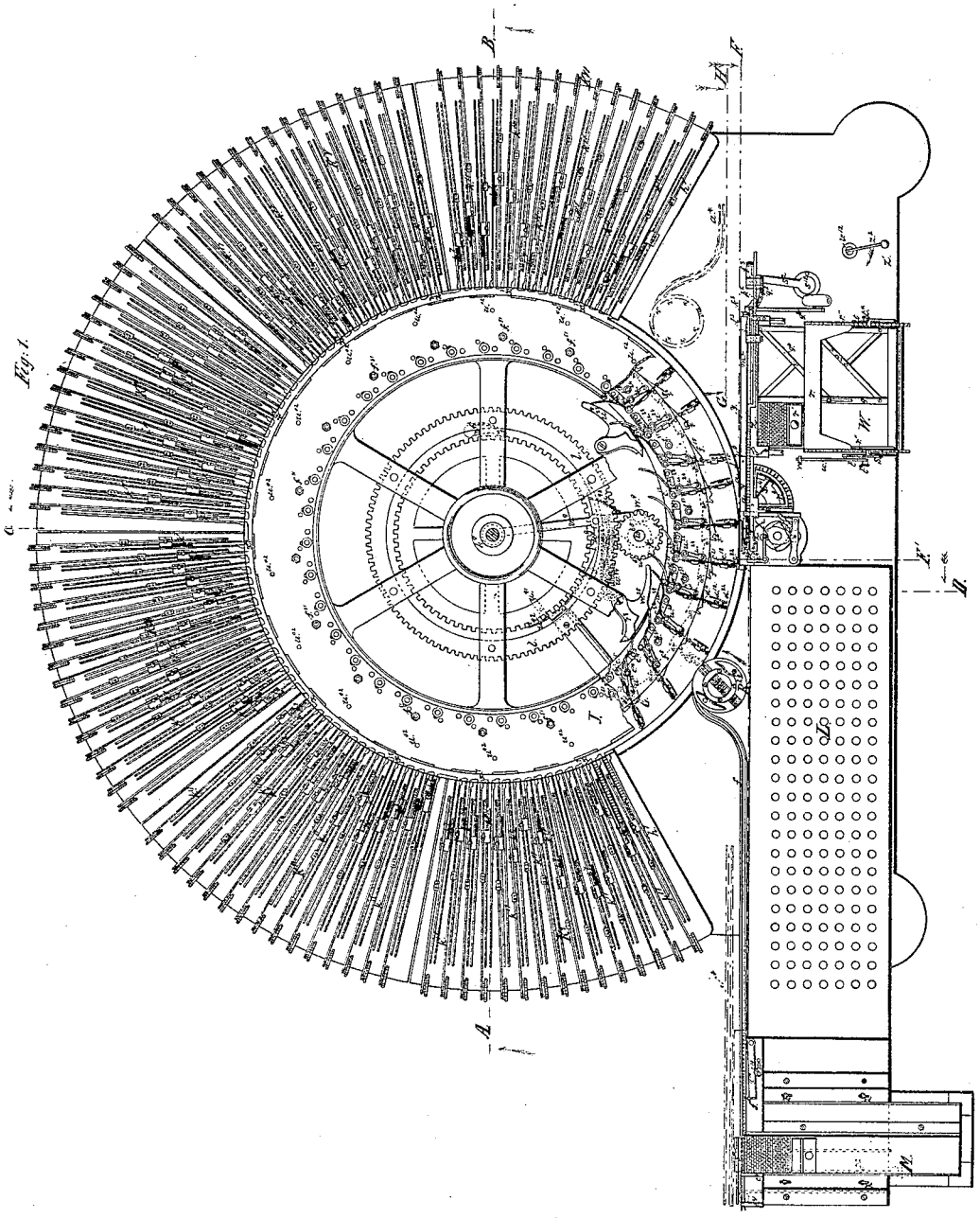
H. W. ALDEN & W. MACKAY.

Type Setting and Distributing Machine.

No. 52,254. Patented Jan. 23, 1866.



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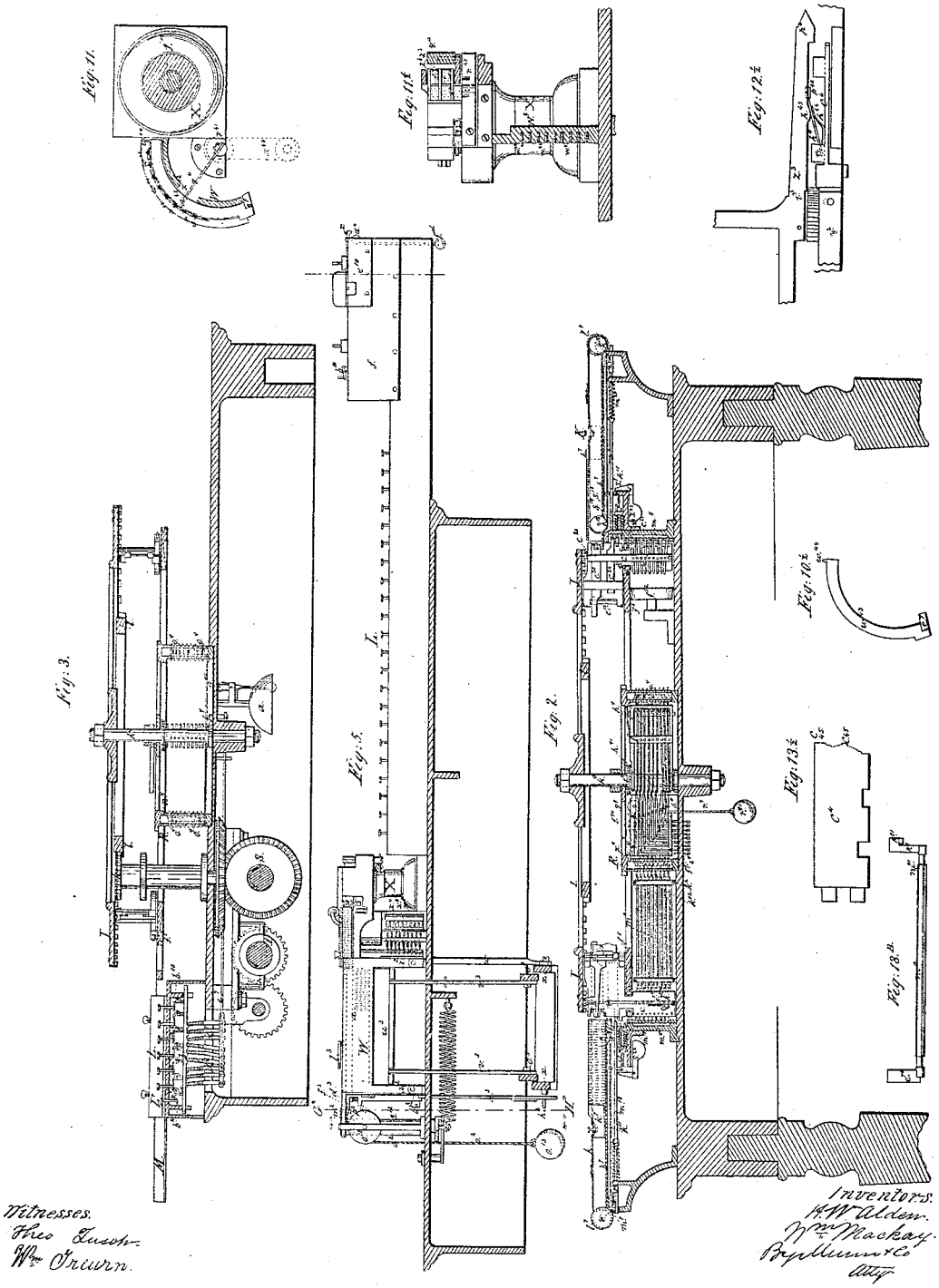

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H. W. ALDEN & W. MACKAY.

Type Setting and Distributing Machine.

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Fig: 4.

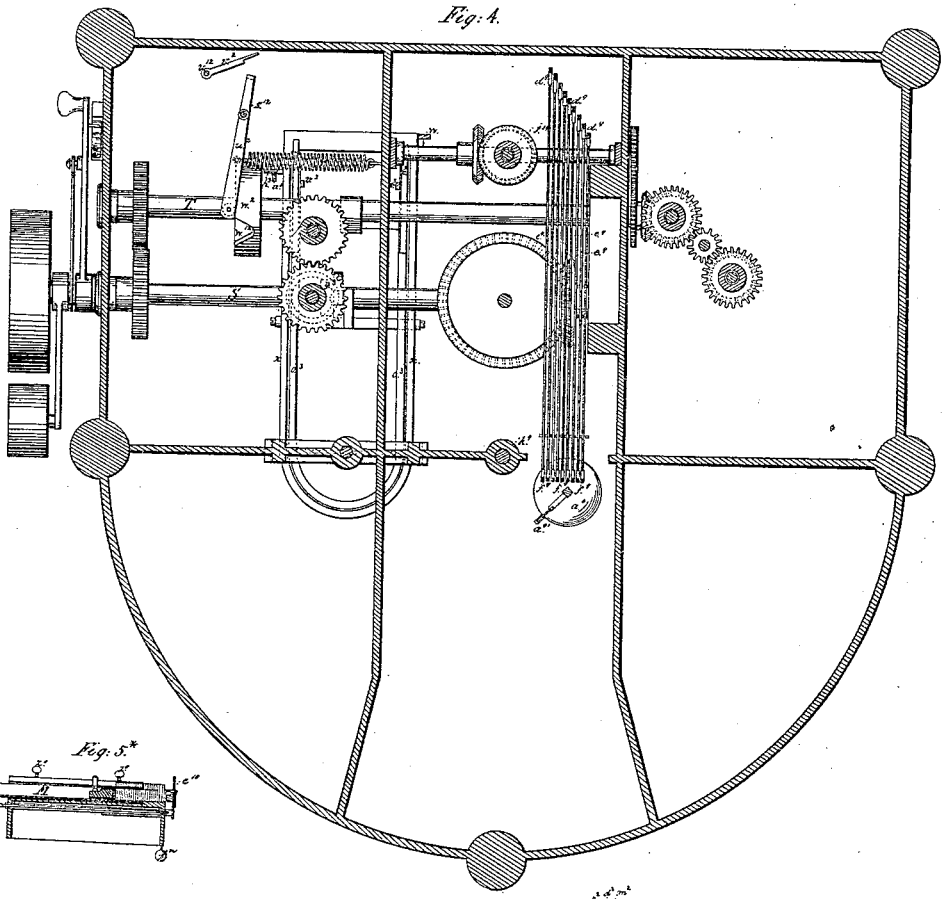

Fig: 5.*

Fig: 7.

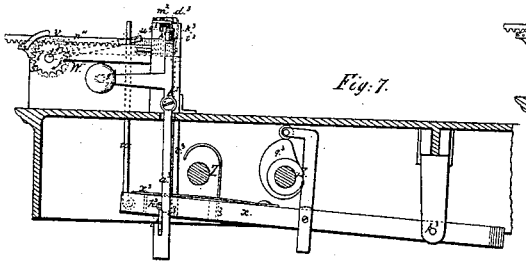

Fig: 8.

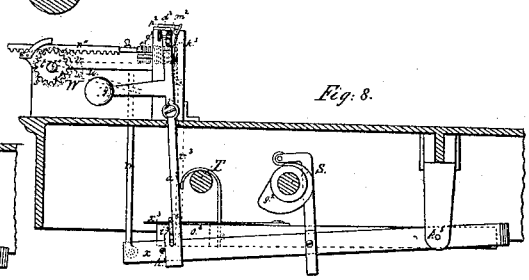

Fig: 6.

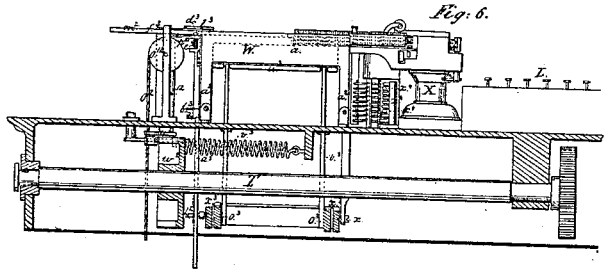

Fig: 8.*

Witnesses.
Thos Tusch
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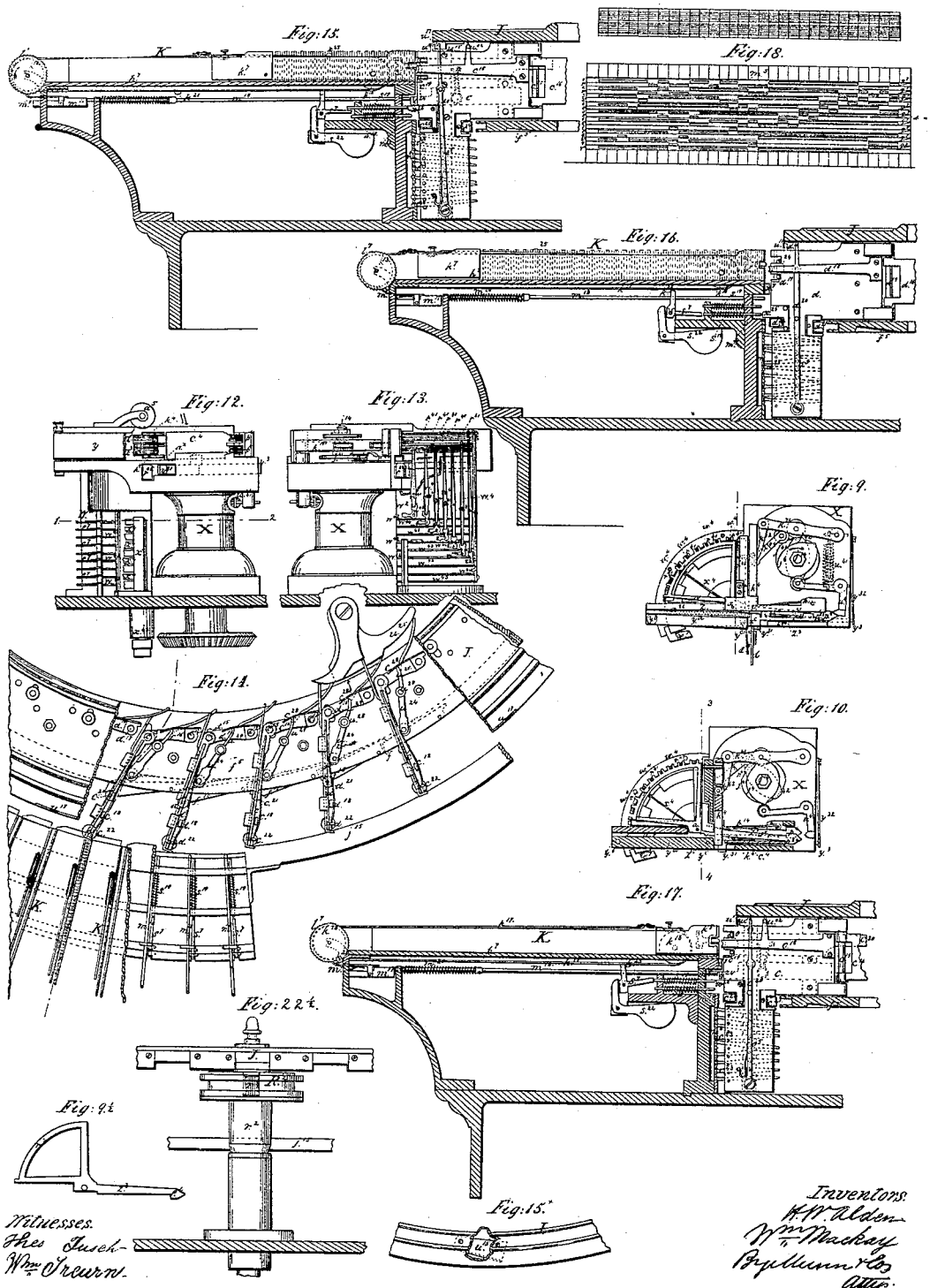

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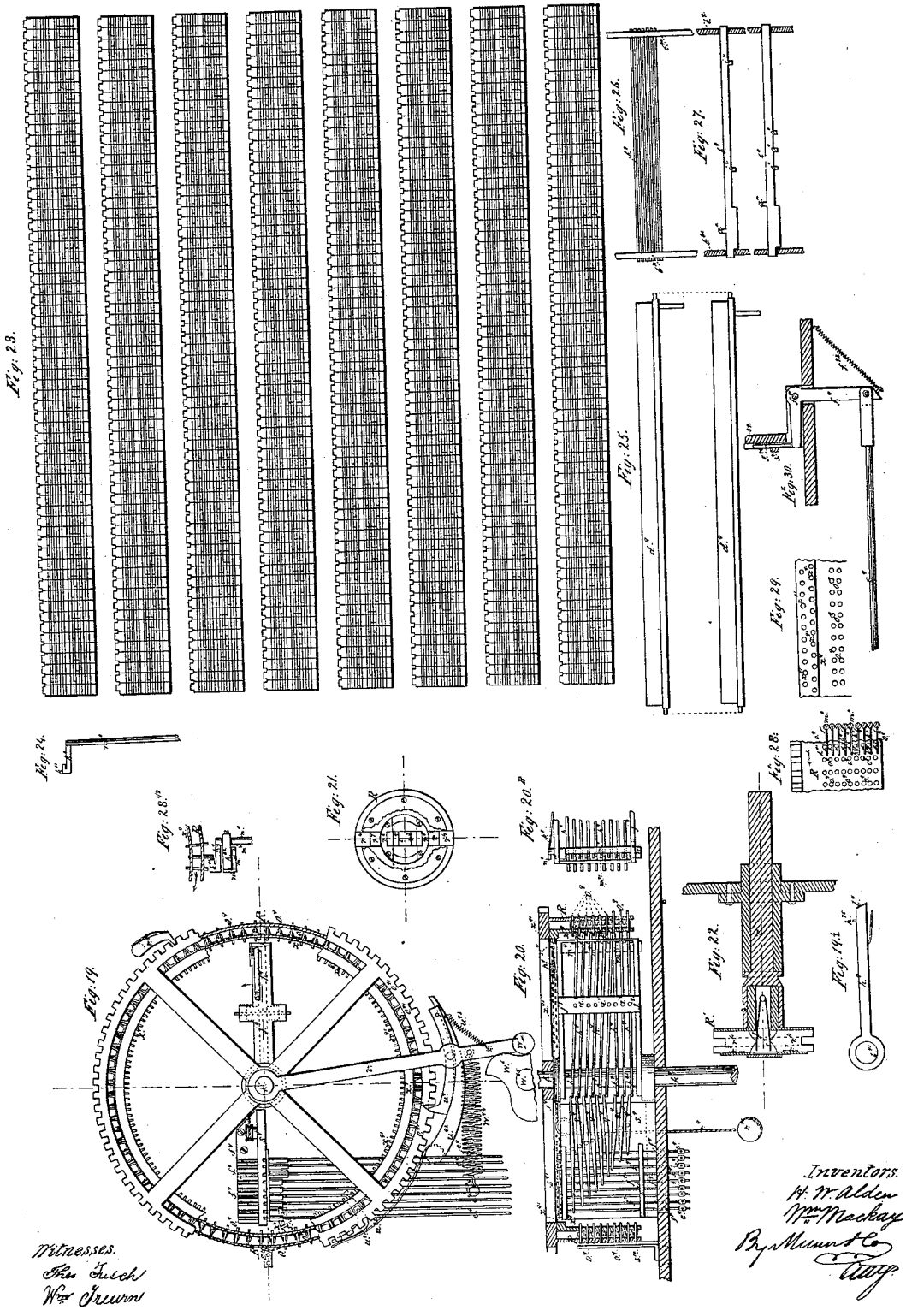

UNITED STATES PATENT OFFICE.

H. W. ALDEN AND W. MACKAY, OF NEW YORK, N. Y.

MACHINE FOR SETTING AND DISTRIBUTING PRINTING-TYPES.

Specification forming part of Letters Patent No. **52,254**, dated January 23, 1866.

To all whom it may concern:

Be it known that we, HENRY W. ALDEN and WILLIAM MACKAY, of the city, county, and State of New York, have invented a new and useful Improvement in Machinery for Setting and Distributing Type; and we do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to make and use the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 represents a plan or top view of a machine constructed according to this invention. Fig. 2 is a transverse vertical section of the same, taken in the plane indicated by the line A B, Fig. 1, and looking in the direction of the arrow opposite to said line. Fig. 3 is a longitudinal vertical section of the same, the line C D, Fig. 1, indicating the plane of section, and looking in the direction of the arrow opposite to that line. Fig. 4 is a horizontal section of the same, showing the mechanism below the table or bed-plate. Fig. 5 is a transverse vertical section of the same, the line E F, Fig. 1, indicating the plane of section, and looking in the direction of the arrow opposite to that line. Fig. 6 is a similar section, taken in the plane indicated by the line G H, and looking in the direction of the arrow opposite to that line. Figs. 7 and 8 are partial transverse vertical sections of the same, taken in the plane indicated by the line G* H*, Fig. 5, and looking in the direction of the arrow opposite to that line, showing the parts in two different positions. The remaining figures are all of parts in detail on a larger scale than the previous figures, and they are fully referred to in their appropriate places.

Similar letters of reference indicate like parts in all the figures.

This invention relates to certain improvements on a machine for setting and distributing type which is partly automatical in its operations and partly operated by the action of an attendant. The purely automatical part lies in the type-distributing mechanism, while the setting of the type is governed by the attendant. Both setting and distributing may be going on at the same time, or separately.

The machine consists, principally, of a type-carrying wheel supported in a horizontal position above a suitable bed-plate or table, a plan view of which is semicircular, or rather of a horseshoe form. Around the circular part of the table are arranged the type-cases. These consist of a series of narrow channels of the width of a type and pointing toward the center of the type-carrying wheel, the inner ends of the channels terminating near the circumference of said wheel. These type-cases embrace about two-thirds of the bed-plate. The square part of the bed-plate forms a table upon which stands the mechanism for distributing and composing in connection with the type-carrying wheel, the right-hand half of said table being occupied by the former and the left by the latter.

Upon the extreme left of the bed-plate rests the galley, wherein the type, as fast as set up into lines, is formed into column. Next to this galley, and extending to the center of the table, is a series of keys consisting of buttons the shanks of which pass vertically through the table, and actuate a series of levers leading to the inside of the carrying-wheel, where they effect the set of the indicator by which the proper type is taken from its case and brought round to the setting-table, where it is deposited in a channel and fed along toward the galley, to be formed into column. On the opposite side of the table is another galley or bed to hold the column of dead matter or type to be distributed. At the head of this galley is a channel which terminates at about the center of the table, near to the periphery of the carrying-wheel, and in a tangential position to the same. By the operation of suitable mechanism, as a line of type is taken off the column, that line is forced along the channel toward the carrying-wheel, so that as the type is pushed off and distributed the column is fed up and another line is taken off, and so on, until the whole is distributed into the cases. The manner in which the type is distributed, so that the proper case it is to go into can be indicated, is effected by a system of nicks upon the shanks of the type itself, whereby, before leaving the channel and being taken up by the conveyer on the carrying-wheel, certain parts are set in a given position, which indicates the proper case into which the type is to be deposited, so that the wheel holds on to the type until by its revolution said type arrives

opposite the mouth of the appropriate channel of the set of cases first mentioned, when it is deposited therein, the type maintaining always its erect position.

Secured to the carrying-wheel are two sets of conveyers, one set being for distributing and one for setting. These are plates so constructed and fixed to the carrying-wheel that while the latter has a constant and unvarying motion the former may be permitted to stop for a period, and then go on with the wheel, and also to overtake and resume the former position. On each conveyer is a spring to gripe the type, and also certain parts which effect the opening and closing of the same, together with means for thrusting the type out of the conveyer. The times for opening and closing the spring and for thrusting the type out are governed by two sets of mechanism. In the case of distributing this is accomplished automatically, and is determined, as before remarked, by the nicks on the type; but in setting it is governed according to the will of the compositor who plays upon the keys. These conveyers are arranged around the carrying-wheel alternately—*i. e.*, first a setting-conveyer, and next a distributing-conveyer, &c. There may be eighteen, more or less, of each kind to the wheel. These conveyers, when the machine is both composing and distributing, stop once or twice at each revolution of the carrying-wheel, as follows: The distributing-conveyer always stops at the end of the channel leading from the column of type being distributed, and, having taken a type, stops again at the proper channel in the case for that letter, provided it carries a regular type and the case said type is to go into is not full. The setting-conveyers stop at the channel indicated by the compositor through the keys, and they may be made to stop again to deposit their types at the mouth of the channel leading to its column or the galley; or said channel may be so arranged that the conveyers deposit their types without stopping. This machine has also the peculiar characteristic that the compositor can compose ahead or faster than the type is delivered by the wheel. There is a twofold object for this. One is that the carrying-wheel shall have a constant and unvarying motion, without regard to any exactness of time in the compositor's playing of the keys; second, by being able to compose ahead he is relieved from so constant attention to the copy, and may have intervals of time to look occasionally to see to the correct working of the distributing part, as also to justify his lines and set the same into column upon the galley, besides affording a certain amount of physical relief. The continuous revolution of the carrying-wheel is therefore effected by an independent power of suitable character, and the speed of the same is to be such as to allow of the necessary time for the conveyers to operate.

The improvements which form the subject-matter of this present invention consist in giving to the conveyers a direct motion in the direction of the indicator-points upon them, and in order to effect this purpose said conveyers are hinged to a link which allows them to swing back and forth in a radial direction. Each conveyer is also combined with a lever, which, by coming in contact with a suitable stud, causes the same, after it has been arrested, to overtake and reassume its original position in the carrier-wheel, and by subjecting the conveyer to the action of a spring applied in combination with the aforesaid lever the backward motion of the same is produced. Sectional flanges applied to the carrier-wheel prevent the conveyers, after the same have advanced, from receding before the operation of depositing or receiving a type has been accomplished. The excavated ring, which allows the conveyers to fall in at the proper moment, is placed on the outside of the conveyers, instead of on their inside, as before, and a portion of the same is taken off and replaced by a simple rail, whereby the construction of the machine is considerably simplified and its cost reduced.

The cases which receive the type from the distributing-conveyers or deliver them to the setting-conveyers are provided with pushers which are secured to an endless cord, and this cord is provided with two projections that act on a tilting elbow-lever when the case is full or empty, and bring the same in such a position that by its action on suitable spring-stops the distributing-conveyers are prevented from stopping before a full case and the setting-conveyers before an empty case.

Suitable cams secured to the under surface of the carrier-wheel govern the motion of the levers, which, in the setting-conveyers, produce an action on the pushers in the type-cases, and which, in the distributing-conveyers, act on the pushers which throw the type held in said conveyers out into the type-cases.

The conveyers are provided with suitable griper-springs and suitable stops on the carrier-wheel or under the mouth of the type-channel keep those springs open in the proper position to receive the type. The setting-conveyers, on delivering their type to the channel leading to the galley, do not stop, the type being received in a revolving receiver, the circumferential velocity of which is equal to that of the carrier-wheel, and which is so arranged as to be able to receive any type which is presented by one of the conveyers. A similar revolving receiver may be arranged at the head of the channel or cup, intended to receive from the distributing-conveyers such types or characters for which no case is provided, or which do not find room in their appropriate cases.

The type, before being received by the distributing-conveyers, are pressed against a series of type-levers, and by the nicks in the type a set is given to said type-levers, which is transmitted by other devices to the indicators, and thereby a set is given to the indica-

tor-points of said distributing-conveyers, which enables them to stop opposite the appropriate type-case. A sliding stop, which acts in conjunction with the type-levers, is so arranged that it opens the type-channel just far enough to let out one type, and a hinged apron, applied in combination with this sliding stop, is brought into action when a thin space or any other type having no nick presents itself.

The set of the indicator-points of the setting-conveyers is produced by a series of movable inclined planes with suitable lips or projections, and these inclined planes act on the inside of the conveyers, whereas the set of the indicator-points of the distributing-conveyers is produced on the outside.

This machine may be properly set forth under three general heads or divisions—viz., first, the mechanism for conveying the type to and from the type-cases and composing and distributing tables, including the arrangement of the type-cases; second, the mechanism for distributing the type in connection with the aforesaid means; third, the mechanism for setting the type in connection with the first-named means.

The type is carried from one place to another by a wheel kept in constant rotation by some suitable power independent of the attendant upon the machine. This wheel, J, is supported in a horizontal position above a suitable bed-plate or table, a plan view of which is semicircular, or rather of a horseshoe form, as seen in Fig. 1. Around the circular part of the table are arranged the type-cases K, being a series of narrow channels, each of the width of a type, and pointing toward the center of the type-carrying wheel, the inner ends of the channels terminating near the circumference of said wheel. These type-cases embrace about two-thirds of the bed-plate. The square part of the bed-plate forms a table upon which stands the mechanism for distributing and composing, in connection with the type-carrying wheel, the right-hand half of said table being occupied by the former and the left hand by the latter. Upon the extreme left is the galley M, wherein the type, as fast as set up into lines, is formed into columns, immediately adjoining which is a series of keys, L, consisting of buttons the shanks of which pass vertically through the table and actuate a series of levers and wires leading to the inside of the carrying-wheel, where they effect the set of the indicators, by which the proper type is taken from its case and brought round to the setting-table, where it is deposited in a channel, *f*, and fed along toward the galley to be formed into column. On the opposite or right-hand side of the table is another galley or bed, W, to hold the column of dead matter or type to be distributed. At the head of this galley is a channel, *a*, which terminates at about the center of the table and near to the periphery of the carrying-wheel, and in a tangential position to the same. By the operation of suitable mechanism each line, on being taken off the column, is forced along the channel toward the carrying-wheel, so that as the type is pushed off and distributed the column is fed up, and another line taken off, and so on, until the whole is distributed into the cases.

The manner in which the type is distributed so that the proper case it is to go into can be indicated is effected by a system of nicks upon the shanks of the type itself, whereby, before leaving the channel and being taken up by the conveyer on the carrying-wheel, certain parts are set in a given position, which indicates the proper case into which the type is to be deposited, so that the wheel holds onto the type until, by its revolution, said type arrives opposite the mouth of the appropriate channel of the set of cases K, when it is deposited therein, the type maintaining always its erect position.

Secured to the carrying-wheel are two sets of conveyers, *c* and *d*, one set, *d*, being for distributing, and the other, *c*, for setting. These are plates so constructed and fixed to the carrying-wheel that while the latter has a constant and unvarying motion the former may be permitted to stop for a period and then go on with the wheel, and also to overtake and reassume their former position.

On each conveyer is a spring to gripe the type, and also certain parts which effect the opening and closing of the same, together with means for thrusting the type out of the conveyer. The times for opening and closing the springs for taking the type and for thrusting the same out are governed by two sets of mechanism. In the case of distributing this is accomplished automatically, and is determined, as before remarked, by nicks on the type; but in setting it is governed according to the will of the compositor who plays upon the keys. These conveyers are arranged around the carrying-wheel alternately—that is, first, a setting and next a distributing conveyer, &c. There may be eighteen (more or less) of each kind to the wheel. These conveyers, when the machine is both distributing and composing, stop once or twice at each revolution of the carrying-wheel, as follows: The distributing-conveyers always stop at the end of the channel *a*, leading from the column of type being distributed, and, having taken a type, stop again at the proper channel in the cases K for the letter they carry; but if the distributing-conveyer carries an odd character, or if the case intended for the type carried by said conveyer is full, the conveyer does not stop, but delivers its type at the appropriate channel of excess without stopping. The setting-conveyers stop at the channel indicated by the compositor through the keys, but they do not stop while depositing their types at the mouth of the channel *f*, leading to the column on the galley.

This machine has also this peculiar charac-

teristic, viz., that the compositor can compose ahead or faster than the types are delivered by the wheel. There is a twofold object for this. The one is that the carrying-wheel shall have a constant and unvarying motion without regard to any exactness of time in the compositor's playing of the keys, and by being able to compose ahead the compositor is relieved from so constant attention to the copy, and may have intervals of time to look occasionally to see to the correct working of the machine, as also to justify the lines and set the same into column upon the galley, besides affording a certain amount of physical relief. The continuous revolution of the carrying-wheel is therefore effected by an independent power of suitable character, and the speed of the same is to be such as to allow of the necessary time for the conveyers to operate.

The first division.—Under this head will be described the mechanism for conveying the type from place to place, the arrangement and construction of the type-cases, with the mode of delivering and receiving the type in the same, together with the various devices for indicating what types are to be thus delivered and received in the process of composing and distributing.

The type is carried to and from the cases by means of a constantly-rotating wheel, J, which is placed horizontally upon a central axis. This wheel is not supported by its axis, the pin k^9 forming said axis, being merely to keep the carrier accurately in a central position. As the types are conveyed upon the wheel by distinct conveyers, it is fitted to support them in the following manner: A frame is formed by the addition of a metal rim, f^5, of a somewhat smaller diameter than the wheel J, and connected to the same by a series of bars or pillars, f^{51}, thus leaving a space between the two sufficient for introducing the inner ends of the conveyers. The wheel J is supported by this rim, which is elevated above the bed-plate and runs upon wheels f^{52}, as shown in Fig. 2. Three or four such wheels are sufficient, if placed at equal distances apart at different points of the rim. The wheel J is made to revolve by a toothed circle, *l*, secured to the under side of the arms, into which a pinion, *k*, works, and which is driven from beneath by being geared to the main shaft S, as seen in Fig. 3.

The conveyers, which form an essential part of the type-carrying apparatus, are attached to the wheel so that their inner ends occupy the space between the rim f^5 and the rim of J. The general shape of these is that of an L-shaped plate, end views of which are shown in Figs. 1 and 14, and elevations in Figs. 2, 15, 16, 17, and other figures. The setting-conveyers *c*, however, differ slightly from the distributing-conveyers *d*, the former being made to receive type from the cases, while the other is to deposit them therein. In other respects both are required to go through the same set of motions upon the carrying-wheel J. These motions are of two kinds. The one is a vibratory or oscillating motion toward and from the center of the wheel J upon a vertical pivot, c^{15} d^{15}, which connects the plate to a link, c^{16} d^{16}, that is also hinged to the wheel by vertical pivots c^{17} d^{17}, and the second a sliding or reciprocating motion in the direction of the circumference of the wheel.

To understand the object of these motions, a description of the mechanism of the conveyers will be necessary; and, first, the mechanism for gripping the type. This is formed of a simple spring, c^{18} d^{18}, which is screwed or riveted to plates *c* and *d*, and the loose end or point of which extends beyond the outer edge of said plate, so that the same opens by coming in contact with the type as the conveyer advances with the carrying-wheel, and by suitable mechanism, hereinafter described, the type is pushed between the spring and plate, and held there until it is to be delivered at the proper case, channel, or receiver. While in the conveyer the type is supported by a foot, c^{19} d^{19}, as clearly seen in Fig. 16, and this foot is common to both classes of conveyers.

On the inner edges of the descending portions of the L-shaped plates *c* and *d* are friction-rollers c^{21} d^{21}, which bear against dogs f^{15} hinged to the ring f^5, and subjected to the action of springs which have a tendency to force the conveyers out from the center. These dogs are provided at their loose ends with concave recesses f^{16}, intended to receive the rollers c^{21} d^{21} and to retain the conveyers when they have arrived in their most advanced position.

While passing the front of the table or bed-plate of the machine the conveyers are prevented from moving out in a radial direction by a stationary rail, j^{15}, and in order to reduce the friction-rollers c^{22} d^{22} are inserted in the outer edges of the conveyers which bear against said rail, as shown in Figs. 1 and 14. After passing the stationary rail the conveyers are held in toward the center by the action of the indicator-points c^{23} d^{23} against the inner concave surface of the excavated rim m^5. A detached inside elevation of this rim is shown in Fig. 18, and sections of the same are shown in Figs. 2, 15, 16, and 17. This rim is provided with a combination of excavations, which correspond to the set given to the indicator-points, either by the action of the compositor on the keys L or by the nicks in the edges of the types and the distributing mechanism, which will be hereinafter described. For instance, if the indicator-points of a conveyer are set to correspond to the letter *a*, said conveyer will travel round on the excavated rim until it arrives at such a point where the excavations in the rim correspond to the set of the indicator-points for said letter. At that point the conveyer is allowed to follow the pressure of the spring-dog f^{15} and to move in a radial direction toward the type-cases. While moving in this direction the lever c^{20} or d^{20} on the conveyer comes in contact with a

stationary cam, u^{15}, at the under surface of the carrying-wheel J, and by the action of this lever a slide, c^{24} d^{24}, is operated, which causes a type to be delivered to the setting-conveyer or to be discharged from the distributing-conveyer.

The shape of the cam u^{15} is shown in Fig. 15*. It acts when the conveyer is allowed to move in a radial direction and when the same is caused to stop. By the radial motion of the conveyer the point of the cam u^{15} is made to catch under the point of the lever c^{20} and d^{20}, and as the wheel J advances said lever pushes out the slide. At the same time the conveyer is held up to its work by a pin, u^{16}, projecting from its upper edge and made to catch outside a sectional flange, u^{17}, secured to the periphery of the wheel J, as shown in Fig. 15. When the conveyer is not permitted to move out in a radial direction the pin u^{16} keeps behind the flanges u^{17}, as shown in Figs. 16 and 17, and the point of the lever c^{20} and d^{20} does not strike the cam u^{15}. The levers c^{20} d^{20} are pivoted to the plates c d, as clearly shown in Figs. 15, 16, and 17, precisely in the same position in the setting-conveyers and in the distributing-conveyers; but the slides c^{24} in the setting-conveyers are in a different position from the slides d^{24} of the distributing-conveyers. The slides c^{24} of the setting-conveyers are below the foot c^{19}, which supports the type, and they act on rods m^{18}, which extend under the type-cases K, as shown in Fig. 15, where a setting-conveyer is shown in the act of taking a type.

The slide d^{24} of the distributing-conveyers are situated above the foot d^{19}, and by their action the type carried by said conveyers is pushed out into the case. During the time a type is delivered from or received by one of the cases the conveyer is retained for a short time by coming in contact with a stop, x^7, at the end of each case; and since the carrying-wheel J never stops, it follows that each conveyer, after having received or delivered its type, moves in the direction of the circumference of the wheel, or, more properly speaking, the wheel moves while the conveyer remains stationary.

The relative position of the conveyer and wheel after having received or delivered its type is shown in Fig. 14, where c^* represents a setting-conveyer which is just in the act of stopping to receive its type, whereas the remaining conveyers represented in the figure have already reassumed their advanced position. In order to cause the conveyers to reassume their advanced position a lever, u^{24}, is pivoted behind each conveyer to the ring f^5. This lever is provided with a friction-roller in that end which bears on the conveyer, and its tail extends beyond the inner edge of the ring f^5, and as the carrying-wheel J rotates said tail strikes a stationary cam or stud, u^{25}, and by this action the lever is thrown in the direction of arrow 2, (marked near it in Fig. 14,) and the conveyer is thrown forward in its advanced position.

The cam u^{25} is in such a position that the tails of the levers strike the same after the conveyers have passed the type-channel f. Another cam, u^{25*}, acts on the tails of the levers of the distributing-conveyers only, which are placed somewhat lower than the tails of the levers of the setting-conveyers. The position of this cam is seen in Fig. 1. The lever u^{24} also serves to cause the conveyers to recede in a radial direction after they have received or delivered a type. In order to effect this purpose said lever is mounted on a vertical arbor, u^{28}, which has its bearings in the rim f^5 and in the carrying-wheel J. From the upper end of this arbor extends an arm, u^{29}, which bears on a spring, c^{28}, that is secured to the link c^{16} and d^{16}, as shown in Figs. 1 and 14. When the wheel J advances while the conveyers remain stationary, the lever u^{24} is turned in the direction opposite the arrow marked near it in Fig. 14, and thereby the point of the arm u^{29} is made to bear on the spring c^{28}, and the link is caused to swing in the direction of arrow 1, carrying the conveyer back in a radial direction.

While receiving the type the griper-spring of the setting-conveyer is held open by a stationary pin, u^{02}, in the carrier-wheel in Figs. 15 and 17, which is so situated that when the conveyer occupies its advanced position the spring strikes said pin, but as soon as the conveyer recedes the spring closes up and gripes the type. The griper-spring of the distributing-conveyer is opened by the projection y^c, which will be hereinafter more fully explained.

The indicator-points c^{23} d^{23} on the conveyers, and the excavated rim m^5, will be described together, as they act in conjunction. The latter is a broad flat rim of moderate thickness, and is of such a diameter and width that when secured in place upon the table it shall fit just outside and under the carrying-wheel J, as clearly shown in Figs. 2, 15, 16, and 17. A section of the excavated rim is taken out and replaced by a segmental rail, j^{15}, as previously stated. In constructing said excavated rim a portion of its inner surface has a series of grooves cut on it of equal width and parallel to each other, as seen in the detached view of a portion of the rim shown in Fig. 18. The excavations are made in these grooves by cutting slots of different degrees of length and after a certain order, but having an irregular general appearance. The conveyers are placed upon the carrying-wheel so that their descending shanks stand opposite to this line of excavations, and the indicator-points are a series of separate pieces of metal attached to the plates c d by pivots o^5, and their ends are rounded and point in the direction of the excavations. Said indicator-points are not pinned rigidly to the conveyer, but they must be able to have a movement. Each one is therefore provided

with a friction-piece to cause them to stand in any position that may be given to them.

The rim m^5 is provided with two grooves to each indicator-point. Thus in Fig. 18 eighteen grooves are shown, while in Figs. 15, 16, and 17 there are nine indicator-points exhibited on each conveyer, and it is by shifting these points so that they will track into the different grooves according to a set given to them at a definite starting-point that the proper indications are formed for depositing and taking the type from the cases. In every revolution of the conveyers they pass a place on the rail j^{15}, where these points receive a set, which may be called zero, and after passing which place a new set is given for a different type than the one previously carried, in fact, even if it is to carry again a type of the same character as the former one. This is performed by the action of a series of inclined planes, g^7, which are placed in such a position that they correspond to each alternate groove, which are numbered 9 8 7 6 5 4 3 2 1, and the intermediate grooves are represented by 9° 8° 7°, &c. As each indicator-point has two grooves into which it may play, some may have been previously put into grooves 9° 8°, &c., and some allowed to remain in the grooves 9 8 7, &c.; but it is intended that at each revolution all the points shall be set, so that there shall be one point bearing on each of the grooves 9° 8°, &c., and move in the others, although in reality the inclined planes are secured to the rail j^{15} where the grooves are removed, and the points are turned down only to correspond to the position above stated.

Suppose that as a conveyer approaches (which it will in the direction of the arrow) all its points had been previously set so that they stand in line with the grooves 9 8 7, &c., respectively, all these points would be intercepted by the inclined planes g^7, and as the surface of these incline downward the points would slide down, and they all would be turned on their pivots and set so as to ride in the grooves 9° 8° 7°, &c.—that is to say, the point in groove 9 will be turned into 9°, the point in groove 8 into 8°, &c., throughout. The indicators are a device for afterward shifting these points, or a portion of them, back again from grooves 9° 8° to those marked by the numbers 9 8 7, &c., or vice versa. Suppose an excavation in the rim, which would be indicated by merely shifting one of the points, allowing all the others to remain as they are—as, for example, from 9° to 9—this woul l be performed by the indicator acting only upon such point to effect its transference. These indicators are small inclined planes, precisely like those already described, and are arranged in the proper position in relation to the indicator-points, the indicators of the distributing-conveyers on the outside, and those of the setting-conveyers on the inside of said conveyers, as will be hereinafter more fully described. The tails of the indicator-points on the distributing-conveyers, therefore, are cut off, as shown in Fig. 16, while those of the setting-conveyers project beyond the inner edges of the plates c, as shown in Figs. 15 and 17.

The indicators e^7 (see Fig. 12) serve to set the indicator-points of the distributing-conveyers, and the indicators e^{7*} (see Figs. 2 and 18^B) those of the setting-conveyers. Both are movable plate placed in line with the grooves 9° 8° 7°, &c., or 9 8 7, &c., and arranged so that they can be brought in a horizontal or in an inclined position, and the indicators e^7 are all acted upon automatically by the distributing mechanism, whereas the indicators e^{7*} are set by the compositor. As by the stationary inclined planes g^7 all the indicator-points are shifted into the grooves 9° 8° 7°, &c., so by the indicators e^7 e^{7*} they may all be shifted from said grooves to those numbered 9 8 7, &c.

The indicators e^7 are shown in Fig. 12, and the indicators e^{7*} in Figs. 18^B 28, and by referring to Figs. 15, 16, and 17 different positions of the indicator-points can be seen. There is this difference, however, that the indicator-points of the setting-conveyers must all be turned up before the indicators e^{7*} take action, while the indicator-points of the distributing-conveyers are turned down, and it is therefore necessary to have a separate series of stationary inclines to set the setting-conveyers to zero, and, in reality, the stationary inclines for the distributing-conveyers are on the outside and those for the setting-conveyers on the inside of said conveyers. If the conveyer arrives at such a point of the excavated rim where all its indicator-points are allowed to sink in, it (the conveyer) is immediately arrested, and the type taken or deposited, according as it was a setting or a distributing conveyer acted upon, as already described.

Before a conveyer can receive a type from or deposit one in the type-cases it must always be in the advancing end of the latch f^{15}, as shown in Fig. 14, because while doing so the conveyer must stop, and the carrying-wheel, by continuing its motion, slides, as it were, past the conveyer which has been arrested by the fixed stop x^7, and at the proper time the lever u^{24} causes the conveyer to reassume its advanced position, as previously stated. The tail of this lever comes in contact with one or both cams, u^{25} u^{25*}, which are situated inside the carrying-wheel K, as shown in Fig. 1. These cams are sufficient, because the conveyers do not stop except at the distributing-box, and then again at one of the regular type-cases; but the setting-conveyers deliver their type in the channel f without stopping, and the distributing-conveyers deliver odd characters and types, which cannot be received in one of the cases K, into the channel of excess, also without stopping. In order to effect this operation revolving type-receivers R^2 are arranged at the mouth of the channels f, and also at the mouth of the channel of excess. The circumferential velocity of these type-re-

ceivers is equal to that of the carrying-wheel, and their construction is shown particularly in Figs. 21, 22, and 22½, which represent a plan and a section of the same, and their position in relation to the channels and to the conveyer is shown in Fig. 1. They are composed of circular heads secured to the upper ends of a vertical spindle, r^2, to which a revolving motion is imparted by suitable gearing. Each head is provided with a series of radial slides, r^4, which are forced out by springs r^5, and the motion of which is limited by plates r^6, catching in recesses r^7, which are cut in the edges of the slides, as shown in Figs. 21 and 22.

In order to deliver the type from the setting-conveyer to the revolving receiver R^2 at the mouth of the channel f, each setting-conveyer is provided with a pusher, c^{30}, which extends back beyond the rear edge of the plate c, and is acted on at the proper moment by a cam, r^8, Fig. 1. After the type has been delivered to the receiver it is held therein by the pusher c^{30} until said receiver has rotated far enough to carry the type behind the end of the outside wall of the channel f, into which it is to be deposited, and as the motion of the receiver proceeds the type is forced out into the channel by the action of the springs r^5. The distributing-conveyers, on arriving opposite the channel of excess, are operated in a similar manner; but the distributing-conveyers carrying quadrats receive a set which allows them to fall in and to deliver their type to the proper channel, and the quadrats will be nicked on all four sides, so that they will present themselves in the proper position, however set up.

The type cases or depositories may be divided into three classes—first, for the regular type, second for the irregular, and third for the excess. The regular cases are to receive the type ordinarily employed, the irregular are intended to contain such type as are but seldom used and which are to be put into the lines by hand, and the third is a provision whereby, in case the distributing part has continued so long that the regular depositories are filled, the excess may be received here.

The channel of excess and that of irregular types or odd characters is the same in this machine, and represented by a^*. The channel f^* is intended to receive the quadrats, which are put into the lines by hand, but for which provision is made in the distributing mechanism, whereas the channel of excess will receive promiscuously any type presented by a distributing-conveyer.

The regular type-cases K are narrow channels formed by setting upon a flat bed, h^7, two plates forming parallel sides. The space between these is wide enough to receive the type flatwise, and therefore they differ in width to suit the different letters. A certain number of such channels are arranged upon a common sectional bed-plate, and placed so that they radiate from the axis of the wheel J as a center. In Fig. 1 are shown six beds of type-cases, forming as many sections as indicated by the figures opposite the letters K. These sections, with the types, may be wholly detached from the machine without disturbing any part, and others, containing different fonts, substituted. All the regular cases both receive and discharge type, whereas the channels a^* and f^* are intended only to receive type. In receiving a type into the regular cases the provision for thrusting it in is upon the conveyer; but the discharging is effected by a separate mechanism, attached to each channel, as follows:

In the channel back of the line of type is a block, k^7, which presses squarely up against the rear type. (See Figs. 1, 15, 16, and 17.) Said block is screwed to a metallic band or cord, k^{17}, which extends over the pulleys k^{18}, situated at the opposite ends of the case K. Secured to the outer pulley, and revolving with the same, is the ratchet-wheel l^7, and a spring-pawl, m^7, engages with the teeth of this wheel. Said pawl is secured to a slide, m^{17}, which is connected to the rod m^{18}, that extends through a rim, m^{19}, above the excavated rim m^5. A spiral spring, m^{20}, has a tendency to push the rod m^{18}, with the pawl, toward the center of the carrying-wheel J, and if a setting-conveyer stops before one of the cases to receive a type the pusher c^{24} strikes the end of the rod m^{18}, and forces it out against the spring m^{20}. By this motion the pawl m^7 causes the ratchet-wheel l^7 and the pulley k^{18} to revolve, and the block k^7 is made to move toward the centers and to push a type out of the case. When a type is delivered into a case by a distributing-conveyer the block k^7 recedes by the action of the slide d^{24}, which pushes the type from the conveyer into the cases, and the ratchet-wheel l^7 revolves in such a direction that its teeth slide over the pawl, said pawl being drawn back out of contact with the ratchet-wheel by the spring m^{20}. In delivering a type from the case the motion of the block k^7 and of the ratchet-wheel l^7 is alike for all type, because the type are put edgewise into the cases.

Provision is also made to prevent the setting-conveyers from stopping before an empty case, or the distributing-conveyers before a case which is already full. This purpose is effected by a tilting bell-crank lever, s^7, which is subjected to the action of a weighted dog, s^{22}, that is so arranged that it has a tendency to keep the bell-crank lever s^7 in a vertical and horizontal position, as shown in Fig. 15. In this position the point of the horizontal arm of said lever extends between two spring-bars, s^{18} and s^{19}, which have their bearings in suitable holes in the bed m^{19}. One of these spring-bars is opposite a projection, x^{26}, on the setting-conveyer, and the other opposite a projection, x^{25}, on the distributing-conveyer, and if the conveyer moves out to receive a type or to deposit one this projection comes in contact with the corresponding spring-bar and presses the same out, as shown in Fig. 15.

On the cord k^{17} are two stops, k^{25} k^{26}, and if

the case is empty and the block k^7 close to the inner end thereof, one of these stops comes in contact with the vertical arms of the tilting lever s^7, and throws the same up in the position shown in Fig. 17, carrying the point of its horizontal arm opposite the end of the spring-bar s^{19}. If a setting-conveyer arrives before the empty channels the projection x^{26} comes against the end of the bar s^{19}, which, being prevented from receding by the action of the bell-crank lever s^7, does not allow the conveyer to move out and to stop, and compels it to proceed, with the carrying-wheel J, to the next channel containing the type for which the indicator-points of said conveyer may be set; but if a distributing-conveyer arrives before this empty case it is free to open and to deliver its type, and by the backward action of the block k^7 the stop k^{25} is caused to release the bell-crank lever s^7, and the next setting-conveyer is free to stop before the case and take the type, as usual In the same manner, if a case is filled with type, as shown in Fig. 16, its block k^7 is forced clear to the outer end of the same, and the stop k^{26} comes in contact with the vertical arm of the bell-crank lever, and tilts the same to the position shown in Fig. 16. The point of the horizontal arm of said bell-crank lever is thereby brought opposite the end of the spring-bar s^{18}, and if a distributing-conveyer arrives before the case ready to deliver a type the projection x^{25} strikes the inner end of the spring-bar s^{18}, and the conveyer is not allowed to move out or to stop, and it proceeds with the carrying-wheel to the next case intended to receive the type. This arrangement is of great importance, because in a font of types there are many more of some letters than of others. Hence in arranging them into the cases several channels will be required to contain the most numerous, while a single channel may suffice for the others. Thus, for instance, it might require three channels for the letters *a*, while one would suffice for the letter *x*, &c. By this mechanism just described the operation of a conveyer is such that it always stops at the first channel, (where there are several of the same name,) and takes from that (or deposits therein, as the case may be) until it is emptied (or filled.) It will then go on to the next, &c. In distributing, then, a conveyer will carry all the letters *a*, and begin to fill, say, the first channel, Fig. 1. When that is filled it will go onto the next, and fill that, and so on, and in case there are still more *a's* than the channels devoted to that letter can hold the conveyer will continue all round, and finally deposit it in the channel of excess a^*, which will therefore receive every letter which cannot be got into its proper channel. The setting-conveyers will in like manner draw from the first channel until empty, and then go on to the next of that set; and when by chance the whole of a letter has given out the conveyer will come round empty.

The distributing mechanism, being the second head, will now be described. The parts for this occupy chiefly the right-hand side of the table in front of the carrier and type-cases, and by inspecting Fig. 1 the principal parts visible may be embraced, generally, in the space inscribed by the line F′ F. Opposite to F′ stands the apparatus X, for actuating the set of indicators, thereby determining the destination of each particular type. The distributing-channel *a* will be seen to terminate at the inside corner of the frame of the distributing-stand, and adjoining this is the table W, for supporting the column of dead matter which is to be distributed. Attached to or situated near it are the several parts for actuating the feed. At the head of the feed-table there is an abutting plate, *y*, attached to the main bed-plate, which forms a portion of the type-channel *a*. On the inside, and parallel to this, is the other plate, *z*, to complete the channel. This plate is elevated above the surface of the table W to such a height as to allow the column of type to pass beneath its lower edge. The plate *y* is supported by columns a^2, (see Figs. 5 and 6,) which rise from the bed-plate of the machine, and the line of type passes under the plate *z* in order to get into the cannel *a* from beneath, a whole line being passed up at a time. This is effected by a sliding floor, u^3, which rises at the proper time, lifts the line, and supports it in this elevated position until the line is exhausted. When the floor descends a feed of the column takes place and another line is lifted up into the channel, and so on. Said sliding floor is represented in Fig. 5 in the lowest, and in Fig. 6 in its elevated position. It consists of a thin plate of metal, which stands between the end of the table W and fixed channel-piece *y*. When lowered its top edge is flush with the feeding-table and forms a continuation of it. It is connected to two legs, v^3, descending below the bed-plate of the machine, and terminating in the frame o^3, which performs the raising and lowering. When a line of type has been raised into the channel they must be fed along toward the place of discharge. This is accomplished by a pushing-ratchet, m^2, Fig. 1, which is urged forward by the click g^2, upon a vibrating arm, s^2, actuated from beneath by a cam-lever, u^2, Fig. 6.

Attached to the ratchet is a cord, o^2, which extends over a pulley, o^{12}, and from which a weight, o^{13}, is suspended, which tends always to pull the ratchet back. A check-click, p^2, attached to the standard which forms the guides of the ratchet, holds the same in place, and does not allow it to follow the action of the weight o^{13} until the clicks g^2 p^2 are withdrawn. The arm s^2, which carries the click g^2, is mounted on a vertical rock-shaft, s^{12}, (see Fig. 1,) which extends through the bed of the machine, and carries an arm, u^2, as seen in Figs. 4 and 6. The friction-roller on the end of this arm is kept constantly pressing upon the cam w^2 by a spring, and when the cavity w^{12} in the cam passes by said friction-

roller sinks in, and as the motion of the cam proceeds a feed is given. As a type is thrust from the end of the line the whole are fed along until the gap left is closed, the types then striking against a positive stop. In order to effect this purpose with types of different width the cam is deeper than required for closing up the gap left by discharging the thickest type. A stop, v^2, mounted on the lower end of a vertical rod, v^{12}, and operated by a lever, z^2, serves to throw the roller end of the arm u^2 off from the cam w^2, (see Fig. 4,) and the feed is stopped.

The lever z^2 is seen in Fig. 1, and is operated by a suitable handle. When it is in the position shown in that figure the feed goes on; but if it is moved in the direction of the arrow marked near it in Fig. 1 until its end drops into the hole z' the feed stops.

When a line of type has been fed off the ratchet-clicks g^2 and p^2 will be disengaged, and the weight o^{13} allowed to fall back, and a feed of the whole column of type will take place, and the next line be elevated into the channel a. This portion of the machine will be readily understood by referring to Figs. 1 4, 7, and 8.

It will be seen by referring to Fig. 1 that the feeding-table W is of greater width than the column of type represented thereon. Each side of the table has a gage-plate, and the column is placed to fit against the plate on one side, while the plate g on the opposite side is made adjustable and fixed by parallel bars g^*, or by any other suitable means, so that it can be readily adjusted to any desirable width of column. At the foot of the column there is a small block, r', of the same width as the column. Extending quite over the table is a cross-bar, r, the two ends of which are attached to toothed racks r'', lying parallel to the sides of the table, as shown. Working into these racks are two wheels, t, and adjoining one of these wheels is ratchet-wheel s. These are all upon one shaft, t^*, which lies beneath the table and extends from side to side. Mounted on one end of this shaft is a lever, u, carrying a pawl, v, in such a position that the same engages with the teeth of the ratchet-wheel s, as seen in dotted lines in Figs. 7 and 8, and that the shaft t^* is rotated in the direction of the arrow marked near it in such figures, when the lever u is depressed from the position shown in Fig. 7 to that shown in Fig. 8. Upon the end of each of these levers is a link or connecting rod, w, suspended by lengthened slots w^*, as seen in Fig. 8*, and this rod passes through the bed-plate and terminates in a frame, x, as represented in the several figures. This frame is hinged near its back end by a pivot, p^3, and consequently a portion of its weight is sustained by the lever w. The frame is raised up by means of a cam, g^3, upon the main shaft S, but it falls by its own weight. The feeding up of the column of type will now be readily understood. As the cam g^3 lifts the frame x the rod w raises the lever u, and causes the pallet v to take a next ratchet-tooth, as shown in Fig. 7. The dropping of the frame x, as in Fig. 8, turns the pinions t, which, acting upon the racks r'', push against the cross-bar r', and force up the column of type until the top line strikes the plate y. This line must now be elevated to the position shown in Fig. 6. During the time that the line itself is being fed off the frame x is held up in its elevated position, and only drops down at the moment of giving the feed of the column. It is kept up by a swinging hanger, a^3, which performs also the operation of disengaging the slides g^2 p^2 from the ratchet m^2. At the lower part of this hanger there is a notch-rest, i^3, upon which the frame x is held by a supporting-pin, h^3. The hanger extends above the pin l^3, upon which it swings, its top just terminating under the ratchet m^2, so that it can swing back and forth without interfering with that ratchet. At one side there is a bolt, d^3, inserted in the upper end of said hanger, and kept constantly pressing upward by a spring, e^3, and at the back of the hanger there is a set of feather-springs, k^3. These springs are quite loose, and only acted upon periodically, and a weighted arm, g^3, has a tendency to press the hanger forward.

The unlocking of the parts which cause the feed of both line and column is effected by a nose, f^3, projecting from the inner side of the ratchet, as shown in Figs. 1, 5, and 6. While the line is being fed off the hanger a^3 stands vertically, as shown in Fig. 7, and is kept in this position by the bolt d^3 pressing against the side of the ratchet m^2. By the time the line of type is fed off the nose f^3 has arrived at the place where the bolt d^3 stands, and, continuing in said nose, strikes the top of the bolt and depresses it below the ratchet, when, by the force of the weight on the arm g^3, it will be thrown under, and the hanger a^3 is made to swing so as to bring the supporting-pin h^3 on the edge of the notch-rest i^3. At this point a cross-bar, j^3, at the top of the hanger (seen best in Figs. 5 and 6) strikes against the two clicks g^2 and p^2, which are wider than the ratchet m^2 and project below the edge of the same, and the pin h^3, sliding down the curved face i^{31}, below the rest i^3, moves the hanger still farther, and thus effects the disengagement of the clicks. The object of this curved plane is to assist the weighted arm g^3 by the force derived from the weight of the end of the frame x. This frame now drops down, as shown in Fig. 8, and the ratchet m^2 flies back by the action of the weight o^{13}. When it has receded far enough to bring the driving end clear of the line of type the bolt at the top end of the hanger a^3 must come from under, and takes its place again, as shown in Fig. 7. This is effected by the action of a wedge, l^3, which is adjustable upon the ratchet and capable of being clamped in different positions. As the ratchet flies back the point of the wedge enters under the springs k^3, and increases their tension so much as to overcome

the force of the weighted arm g^3. If there were no obstruction the hanger a^3 would become perpendicular at once; but it will be seen that the pin h^3 on the frame x keeps the bolt d^3 still under the ratchet m^2. This it must do because, although the column of type has been fed up, the line at the top has not been raised into the channel. The cam g^3 now lifts the frame x to a certain height, when it will engage the ends of the interior frame, o^3, which will now be carried along with it in its ascent. The engagement is effected by means of two springs, x^3, the projecting ends of which rest upon the cross-bar of the frame x, as seen in Fig. 4.

To the frame o^3 the type-lifting floor w^3 is attached by rods v^3, as shown in Figs. 5 and 6. The frames now rise together to their full height, and the line of type is raised vertically from the position shown in Fig. 5 to that shown in Fig. 6. At the last part of this motion the pin h^3 rises above the notch-rest i^3, and the springs k^3 cause the hanger to fall into a perpendicular position, as shown in Fig. 7. By that act the clicks g^2 p^2 are re-engaged, and the feed of the line of type immediately commences. It must be understood that the shaft S is in a constant revolution. All these changes have therefore taken place in a moment.

It will be observed that the interior frame, o^3, is lifted by the springs x^3, and in most of the moving parts the connections are, in some form or other, capable of being relieved by springs as safeguards. Thus in case, from any cause, the types stick too hard together to be easily broken from the column, it will be seen that the springs would give, and thus a breakage be probably avoided.

When the type is fed up against the plate y of the channel a it is immediately relieved, as the frame x begins to rise again so soon as it has reached its lowest point, and the lifting-floor is therefore allowed to move up and down freely, and no further device is requisite to reduce or soften the pressure of the type against the plate y or against the lifting-floor w^3. As each type leaves the advancing end of the line it is received in a channel leading to a platform on the distributing-stand X, containing the indicating mechanism, which stand is placed upon the bed of the machine in the position shown in Fig. 1, and which is shown in detail in Figs. 9 to 13, inclusive. Before a type is taken from this platform by a distributing-conveyer the indicators e^7, Fig. 12, must be set to act properly upon the indicating-points of that conveyer. This is accomplished by a system of sliding bars and levers, which are brought into play by means of certain nicks cut in the shank of the type, each type having a certain order of nicks, whereby both their thickness and their denominations are ascertained by the machine. In Fig. 23 is shown a theory for a complete system of such nicks. These, it will be seen, are divided into two groups, and consist of incisions or cuts upon the edge of each type within spaces formed by certain lines, of which the upper set are within seven lines and the lower within eight lines, forming six spaces for the upper and seven for the lower.

Connected to the box are thirteen thin and nicely-constructed levers supported in a horizontal position all upon one axis and arranged in groups, so that their position will correspond with the spaces formed upon the types. Six of these levers belong to the upper and seven to the lower set of spaces, and they serve to determine the width to which the type-channel is allowed to open, the types being divided into thirteen classes, according to their thickness, and also to produce the desired set of the indicators, as will be presently explained.

Fig. 9 represents a plan or top view of the distributing-stand. Fig. 10 is a similar view, partly in section. Fig 11 is a horizontal section of the same, the line 1 2, Fig. 12, indicating the plane of section. Fig. 11½ is a transverse section of the same, taken in the plane indicated by the line 3 4, Fig. 10. Fig. 12 is a rear elevation of the same, and Fig. 13 a front view.

The horizontal levers r^4 have their bearings on a vertical pivot, a', which is secured in suitable lugs or ears projecting from the side of the stand X. Said levers are made of thin plates of steel, and they are placed one on top of the other, thirteen in number, and in two groups, as shown in Figs. 12 and 13. They are composed of arms z^3, (see Fig. 9½,) with pointed wedge-shaped heads p^4, and of segments or quadrants r^4. The arms z^3 extend within the stand X, and the quadrants are situated outside thereof. The position of said levers is such that when a type passes from the channel a^y on the platform a^x of the distributing-stand that edge of its shank which is provided with nicks faces the arms z^3. The channel a^y forms a continuation of the channel a, and its inner plate, y^a, is made to swing on a pivot, y^b, toward and form its outer plate, as clearly shown in Figs. 9 and 10 of the drawings. A spring, r^{14}, has a tendency to close up the latch y^a and to press the type on the platform a^x against the levers z^3, and a cam, j^{41}, acting through a lever, r^{44}, on a slide, r^{45}, opens the latch at the proper invervals. The levers z^3 are provided with slight projections z^{31} on their inner edges, which extend only a short distance (equal to the thinnest type) beyond the end of the latch y^a, so that by the action of said latch only one type at a time is pressed against the levers. By the nicks in the shank of the type a set is given to the levers z^3—that is to say, those levers which are opposite the nicks remain stationary, and those which are opposite the full portions of the shank are forced back, causing their heads p^4 to assume a position as shown in Fig. 10. In this position said levers are held by the action of a hook-shaped bell-crank lever u^4, to which an oscillating motion is imparted by a cam, j^4, mounted on the central arbor, j^{14}, of

the distributing-stand. The set thus given to the levers z^3 is transmitted to the quadrants r^4, which are made solid with or rigidly attached to the same. These quadrants are provided with small pins or forks r^{41}, which project from their peripheries and act on one or more of the upper ends of nine levers, w^4, which have their fulcra or pivots w^{41} inserted in the outer convex surface of a quarter-cylinder, W^2. The diameter of this quarter-cylinder is equal to that of the quadrants, or nearly so, and it is situated under the same, as shown particularly in Fig. 13. It is perforated with nine horizontal slots, w^{42}, equal in number to the number of the levers w^4, and fitted into these slots are segments w^{43}, made of thin sheet-steel, and shaped as shown in Fig. 11 of the drawings. Each of these segments is provided with a stop, w^{44}, projecting beyond the outer convex surface of the quarter-cylinder, and so situated that if the corresponding lever w^4 is thrown in the direction of the arrow marked thereon in Fig. 13, and a bell-crank, w^{45}, is tilted thereby, the lower end of said bell-crank comes opposite to the stop w^{44}, and prevents the segment being moved in the direction of the arrow marked thereon in Fig. 13. By referring to said figure it will be noticed that the lower ends of the levers w^4 catch in the forked ends of the bell-crank w^{45}, and if said levers are in their normal positions, or if neither of the quadrants r^4 have received a set, the loose ends of the bell-cranks are in such a position that they do not interfere with the motion of the segments w^{43}, and since the quadrants r^4 are always brought back to their position of rest by the action of springs p^{14} on the arms z^3 as soon as said arms are relieved from the pressure of the type, it follows that if a type is pressed up against said arms with a nick corresponding to the two uppermost arms or levers z^3, all the levers and quadrants will be actuated except those two, and all the segments w^{43} are prevented from moving except the two lowest ones, which correspond to the upper levers and quadrants.

Secured to the inner ends of the segments w^{43} are the indicators e^7, the shape of which is clearly shown in Figs. 9, 10, 11, and 12, where two different views of the same are shown. They are intended to produce the set of the indicator-points of the distributing-conveyers, and they are formed of small inclined planes, as previously stated. If neither of the segments is allowed to move in toward the carrying-wheel the indicator-points of the conveyers do not come in contact with the indicators e^7, and no set is given them; but if the two lowest segments, or any of the other segments, or any combination of two or more segments, are allowed to move in, a corresponding set is given to the indicator-points of the conveyer, provided said conveyer be a distributing-conveyer, and in that case the conveyer stops opposite the platform a^x to receive the type. The motion of the segment w^{43} is produced by springs x^4, which extend from a vertical arbor, x^{41}, into grooves x^{42}, cut in the inner concave edges of said segments, as shown in Fig. 11. Each segment is moved by its separate spring, and the arbor which carries said springs extends through the bed of the machine, and carries a roller-arm, x^{43}, which is held up to the face of a revolving cam by the action of a spring, so that it receives an oscillating motion. Those of the segments which are retained by the bell-cranks w^{45} are thus enabled to remain stationary, while the remaining segments follow the action of the springs x^4, and produce the set of the indicator-points, as previously explained. The motion of the segments, however, is so timed that the indicators e^7 will be moved out of the way by the time a setting-conveyer comes round, and consequently the indicator-points of these conveyers will not be affected. Each distributing-conveyer, on arriving opposite the platform a^x, is caused to stop by a detaining-hook, y^{31}, which extends from the inner surface of the distributing-stand, and comes in contact with the projection x^{25} of the conveyer. A setting-conveyer will not stop, because its projection x^{26} is situated too high to come in contact with the detaining-hook y^{31}. This hook is rigidly connected to a slide, y^3, which is fitted in a suitable recess in the stand X, and which is forced toward the channel, a^y, by means of a spring, y^{32}; or, instead of the spring, a positive motion may be given to it by a lever, to which an oscillating motion is imparted by a cam on the central arbor, j^{14}.

The slide y carries the graduated stop c^4, which governs its motion, and is connected to it by a tongue which catches in a corresponding recess in the lower edge of said stop, as shown in Figs. 12, 12½, and 13$^x_2$. The object of the graduated stop is to determine and limit the motion of the line of type in the channels a a^y, according to the thickness of the type in front of said line, for if no such provision were made, and the slide or stop were allowed to move an equal distance for every type to be taken from the channel, the thickest type could not get out, and the thinnest type would tumble over and disturb the correct action of the machine. In order to fulfill its proper destination, the outer edge or tail of the graduated stop is formed so that the same presents a series of notches, c^{45}, as shown in Fig. 13½, of unequal depth, and equal in number and position to the levers z^3. The heads p^4 of these levers form shoulders p^{24}, which project over the notched edge of the graduated stop, and prevent the same moving back away from the opening of the type-channel a^y any farther than requisite to let out the first type in the line. The several types in a font, however, are not of uniform thickness, and they may be divided into thirteen classes, according to their thickness, each class being provided with a nick to correspond to one of the thirteen type-levers z^3. If a type is pressed up against the type-levers, all these levers are pressed back except that one

corresponding in position to the nick in the edge of said type, and this lever, being opposite to one of the notches in the graduated stop, allows said stop to open just far enough to permit the type to pass out of the type-channel. If the type is provided with other nicks besides that one necessary to indicate its thickness, those nicks must be so situated that the type-levers corresponding to them will not interfere with the requisite backward motion of the graduated stop. The thickest class of type, therefore, can have but one nick corresponding to that one of the type-levers the head of which is opposite to the deepest notch in the graduated stop c^4.

The number of the indicator-levers w^4 is reduced to nine, in order to simplify the machine. By this arrangement provision is made to open the channel a^y just far enough for each type which has one or more nicks, but for the thin space, which has no nicks, a separate stop is put in, which is brought into action whenever all the levers z^3 are forced back. This stop consists of a small apron, h^4, (see Fig. 12½,) which is pivoted to the stop c^4, and extends down inside of the levers z^3, bearing, by the action of a spring, h^{44}, on projections h^{43}, which rise from the edges of all the levers. Opposite the end of the apron h^4 rises a small stud, h^{41}, from the bottom of the chamber in which the graduated stop moves. This stud is in such a position that the apron will not come in contact with it as long as one of the levers z^3, with its projection, bears against said apron; but as soon as all the levers z^3 are forced back, which takes place when a thin space presents itself, the apron h^4, impelled by the spring h^{44}, falls in, and if the stop moves away from the channel a^y the end of the apron strikes the stud, and the stud is thereby prevented from moving any farther than necessary to let out the thin space. This object may, however, be accomplished in various different ways, and the above mechanism, just described, is only mentioned as an example of one of the devices which will serve the desired purpose.

When a distributing-conveyer stops opposite the platform a^x its spring d^{18} is thrown open by coming in contact with a projection, y^c, on that side of the latch y^a which faces toward the carrying-wheel, and at that moment the pusher k^4 is thrown forward, and the type is delivered to the conveyer. This forked end of the pusher passes through three slots in the inner end of the graduated stop c^4, as clearly shown in Fig. 12, so that it bears against the type at the bottom, in the middle, and on the top, and delivers the same in an upright position. Said pusher is operated by the action of a cam j^{42}, on a lever, k^{41}, which is pivoted to the top of the distributing-stand, and connects with the pusher by a rod or link, k^{42}. A spiral spring, u^{41}, holds the lever k^{41}, and also the inner end of the hooked catch u^4, in contact each with the surface of its respective cam, and the arbor j^{14}, on which these several cams are mounted, receives a continuous rotary motion by suitable gear from the shaft T, as shown in Fig. 4. From this description it will be readily understood how the set is given to the indicator-points of each distributing-conveyer, and it is obvious that these points must be set to zero before they come in contact with the inclined planes or indicators e^7. The manner in which this is effected has been previously described, and it remains to remark that each distributing-conveyer, after having received its set by the indicators e^7, carries the type delivered to it from the platform a^x to the appropriate case, and deposits the same therein, provided it finds room, or if there be no room, or the type happens to be an odd character, it is carried entirely around and deposited in the channel of excess, as previously fully explained.

The third head—viz., the mechanism for composing or setting type—will now be described. The figures required to explain this mechanism will be 1, 2, 3, 4, 5, 6, 19, 20, and from 24 to 30, inclusive.

The front left-hand half of the table, Fig. 1, is devoted to the parts operated by the compositor, and is also the place where the type is received and formed into column. At the back of this table is the receiving-channel f, where the type is delivered by the setting-conveyers, and forms a long line. The channel terminates at the top of the galley M, upon which a column of type is represented in process of formation. This galley is an ordinary printer's galley of the usual width and of any desired length, and it is adjusted, by means of set-screws z^0, between flanged rails M′, which are firmly secured to the bed supporting the galley. The object of using an ordinary printer's galley is to enable the compositor to remove said galley whenever it has received the desired amount of column, together with the type, and to take from it the proof-sheet impression without being compelled to remove the type in a body from the galley. The channel f extends from the revolving receiver R^2 to the head of the galley, which is closed by the follower e^{10}. This follower slides in suitable grooves in the frame or bed which supports the galley, so that it has a reciprocating motion toward and from said head, and its length is precisely equal to the length of line for which the galley is adjusted. For lines of greater or less length different followers have to be inserted, and said follower must therefore be attached in such a manner that it can be readily removed and replaced by another. As the type advances in the channel f, and said channel begins to fill, the compositor pushes the line of type along, by means of a bodkin, until its advancing end strikes the end of the follower e^{10}. At that place the line is divided by a thin plate, f^{10}, which is secured to an oscillating lever, g^{10}, and which may be made adjustable thereon to suit lines of different length. An eccentric cam, b^{10}, which is operated by a suitable handle, serves to push the

plate f^{10} between the type in the channel and to cut off sufficient for one line. If the plate happens to strike on a thick type the line in the channel f is pushed back and the line cut off is justified, and it is then pushed into the galley. This is effected by throwing the follower e^{10} back, pushing the new line up until it strikes the outer abutting plate of the galley, and then turning the follower back to its old position. By this latter motion the new line is forced down into the galley, and the formation of another line can be commenced. In order to prevent the line at the top of the galley from tumbling over when the follower e^{10} is withdrawn, a rod, e^x, is applied, which slides in stationary bearings e^y, and is constantly drawn up toward the end of the channel f by a weight, f^x, suspended from a cord which runs over a pulley, x^e, under the rod e^x, and is secured to the end of said rod, as shown in Fig. 5.

A suitable recess is made in the follower to allow the same to open and close freely without interfering with the motion of the rod. When the follower is thrown back said rod, being close in front of the line at the head of the galley, prevents the type from tumbling over, and as the new line is pushed in the rod e^x recedes; but so soon as the follower is closed, and by its action the new line is forced down into the galley, the rod e^x advances again, and reassumes its original position in front of the galley, impelled by the weights f^x. The channel f is so constructed that its width can be increased or diminished to conform to the width of types of different fonts, and in the same manner the motion of the follower is adjustable, for if the follower would be allowed to open much wider than necessary to admit the new line of type this new line would be liable to tumble over and cause a disturbance.

In order to adjust the motion of the follower, it is made to abut against the point of a set-screw, g^x, which screws into the bed supporting the galley and extends throughout its entire width. By screwing this set-screw in or out the motion of the follower is decreased or increased, and it is adjusted to suit the width of the particular font of type to be used.

Next to the galley is the table L of indicator-keys, a sectional view of which is given in Fig. 3. These keys connect, by a system of levers and "trackers," with the indicating mechanism in the center and beneath the carrying-wheel.

In the description of the distributing mechanism it was shown that all the movements for effecting the set of the indicators were accomplished through the movements of the nine segments w^{13}, Fig. 11. In the composing mechanism there are a like number of indicators for effecting the set of the points upon the conveyers, and these are acted upon by nine levers, which connect the keys with the nine indicators; but as there are a much greater number of keys than of indicators, of course these latter act to form combinations of movements, and these, calculated by the rule for permutation upon nine places of figures, would be ample for the most extensive alphabets or characters of any known language. The keys, as shown, are pins with buttons on top for the convenience of fingering. The pins pass through holes in the table, which holes are arranged in a regular order, so as to form parallel rows, as shown in Fig. 1, each pin acting upon a small cranked lever. a^9, Fig. 3. Beneath these levers is a series of sliding bars, b^9, a bar to each lever and key. These, in consequence of their number and the space they occupy, must be very thin, and are most conveniently made by strips of steel. They are arranged in a rack formed by the plates b^9, as shown in Figs. 26 and 27. Upon the top of each bar there is a single projecting pin, against which the cranked levers a^9 strike, these pins being in a different situation, according to the position of the cranks and keys. Upon the under edges of said bars there are also projecting pins, but instead of being limited to one to each bar, they are not only of various numbers, but also in varying positions, as seen in Fig. 27, where two bars are seen detached. The upper edge shows the single pin a^a, with which each is provided; but on the under edge one has two pins, i^i, stationed far apart, while the other has three, o^o, in succession. These pins actuate the nine indicators that have been already described. Thus, when a key which acts upon this slide is pressed down, all the indicators will be set also; if the key which acts upon the slide i^i, Fig. 27, is pressed down only two indicators will be moved—viz., the top and bottom—while with the next slide three consecutive levers would be moved, and so on. There are nine levers, d^9, shaped as shown in Fig. 25. They have a long fulcrum or axis, the top half of each lever being a blade, while the lower half is simply an arm placed near one extremity of the axis; but as each of these arms connects with one end of the trackers e^9, which lead off to the center of the machine at right angles, the same cannot be placed equally near the ends of the levers d^9, as otherwise the trackers could not be engaged. These latter lie beneath the bed of the machine, and their position is shown in Fig. 4, where the ends of the lever d^9 will be seen engaged, and which will sufficiently explain their arrangement upon the axis on which they oscillate.

It will be seen that the whole row of slides b^9 lies across the tops of the levers d^9 and at right angles to them. Thus any slide can be made to act upon as many levers as may be required for effecting the desired movements in the indicators according to the position of the pins i^i or o^o.

Of the large number of keys represented in Fig. 1 of the drawings each one corresponds to a type of a different name or character, and

by depressing it the indication for each one must be obtained by variously-combined movements of the nine levers d^9.

The trackers terminate at their inner ends in a set of elbow-levers, f^9. (Seen in Figs. 2, 3, 4, 19, 20, and particularly in Fig. 30, where one of these levers, with its connections, is shown detached in full size.) These levers are pivoted to a standard, s^9, which is screwed down upon the bed of the machine, and which is provided with nine slots, each to receive one of said levers, as clearly shown in Figs. 19 and 30. One common rod, f^{91}, forms the fulcrum for all of them, and their horizontal arms are situated above the table, whereas their vertical arms extend through a slot in the same, as seen particularly in Figs. 4, 20, and 30. The trackers e^9 are hinged to the vertical arms of said elbow-levers, and small springs f^{92}, of india-rubber or other suitable material, may be attached to said arms to bring them back to their normal position after each movement. The horizontal arms of the elbow-levers f^9 act on rods or slides f^{94}, which are guided in vertical grooves in the face of the standard s^{91}, hold the slides in the grooves, and prevent them from dropping out accidentally, and each slide is provided with a projection or tooth, s^{92}, which are intended to act on the levers g^9. These levers are pivoted at the middle of their length to the standard or division-plate s^9, one above the other, as clearly shown in Fig. 20, and they are of gradually-decreasing length, according to the position of the tooth with which each of them engages. The first or top lever in the row is the longest, and the lowest or bottom lever the shortest, and in order to divide them all in two equal parts the pivots which form their fulcra are situated in an oblique line. By pulling the trackers e^9 the outer ends of the levers g^9 will be raised and their inner ends depressed, and by their action the motion of the keys is transmitted to the register-levers h^9.

It has been stated that the compositor could compose ahead of the operation of the machine—*i. e.*, without regard to the speed of the carrying-wheel or the delivery of the type by the conveyers—and that he could indicate letters to be delivered to the compositor's table considerably in advance, so that he could be able to stop working, and yet have the letters previously indicated delivered without any further attention on his part. The mechanism whereby this is accomplished is arranged as follows:

The movement of the keys does not directly effect the set of the indicators, but operates instead on a register-wheel so contrived that a considerable number of signs or letters can be, as it were, recorded upon it. The revolutions of the register-wheel bring the parts recording such signs or letters successively to act upon the indicators in time to effect the set of the indicating-points of the next approaching setting-conveyer.

The register-wheel is composed of two broad concentric rings, R x^9, one of less diameter than the other, but both of the same breadth or height. The smaller ring x^9, of course, is inside the larger, thus leaving an annular space between the two. (See Figs. 1, 2, 3, 19, and 20.)

Figs. 2 and 3 show sections of the registering device in the machine, and Fig. 20 a detached sectional view on a larger scale than the figures previously named. Fig. 1 represents a top view of the same when in the machine in working position, and Fig. 19 is a similar view detached and on a larger scale.

Both rings are perforated with a series of small holes, each hole in one being directly opposite to a hole in the other. Nine holes are drilled in a vertical line and at equal distances apart. A short distance from these nine more are drilled in a vertical line, and this is continued until the whole circumference is filled, care being taken that each hole in every vertical line is also on the same horizontal line with its neighbors. These holes are then to be filled with pins o^9, long enough to project beyond the face of the ring R x^9, and to keep them from falling out small friction-springs o^{91} are placed between them, as shown in Fig. 19. Each of these springs bears on two adjoining pins, and presses against them with sufficient force to retain them in their sockets and yet allow them to move in either direction. Every vertical row of nine pins corresponds to the nine indicators, and by these pins the indicators are acted upon. Thus, if there were one hundred such vertical rows upon the circumference of the ring, there could be a like number of indications by one revolution of the same, and it is by pushing these pins out that the indicators can be acted upon by them. Three of the pins o^9 are shown pushed out at the bottom of the vertical row in Fig. 20, while all the rest are pushed in, and consequently out of action. The register-wheel is supported upon the fixed central axis, k^9, and turns upon it. Its motion is intermittent—*i. e.*, it moves by the action of a pawl, notch by notch, it being provided with cogs which engage with the driving-pawl w^9, Figs. 1 and 19. Each movement, however, is of the precise distance between the rows of pins measured around the circumference.

The act of pressing down one of the keys L immediately causes the pushing out of one or more of the pins o^9 in a vertical line, the subsequent pressing down of the same or of another key would act immediately to push out certain pins in the next vertical line, and in this way nearly all the pins might be set ready to indicate letters on the indicators, and such setting of the types would take place in due time as the register-wheel revolved All the pins in the register-wheel cannot be reached, because a portion of the interior space is taken up by fixed mechanism, and consequently the circumscribing register-levers would be inter-

rupted at that part. These register-levers h^9 have a double motion, and this consists in their sweeping round the interior of the ring, and having, also, a vibrating motion in a vertical plane. They are hung in a frame, j^9, which projects horizontally from the center shaft, k^9, to which it is attached by two eyes in the ends of the top and bottom pieces, as seen in Fig. 20, and these eyes are fitted to the shaft so that the frame is free to rotate about the same shaft as its axis. The nine levers h^9 are sustained in a vertical plane, one above the other, by fulcrum-pins i^9, which have their bearings in the vertical bars j^{91}, secured to the frame j^9. The inner end of each lever terminates in a flattened ring, h^{91}, and through all these rings passes the shaft k^9 freely, so they do not come in contact therewith. The outer ends of these levers terminate just short of the surface of the inner registering-ring, x^9, and when not acted upon by the keys they lie in such a position that their ends can pass between horizontal rows of the pins o^9, the top lever standing below the top pin and the lowest lever beneath the lowest pin. Said levers are composed of thin plates of metal having considerable breadth, as shown in Figs. 19½ and 20, the former figure representing a plan or top view of one of said levers detached. The outer ends, l^9, of these levers are, furthermore, beveled in one direction, as seen in Figs. 19 and 19½, and they are so situated in relation to the inner ends of the pins o^9 that if one of them is raised in line with a row of pins, and the frame j^9 rotates in the direction of the arrow marked near it in Fig. 19 every pin in said row with which the end of the lever comes in contact will be pushed out. The frame j^9 is propelled in the direction of said arrow, Fig. 19, by a pulley, t^9, which is attached to it, as seen in Fig. 20, and to which a cord, r^9, is secured, having a weight, r^{91}, at its free end, as shown in Figs. 2 and 20, and this cord is connected to the frame in such a manner that the weight produces a motion in the desired direction.

The travel or motion of the frame is governed by an escapement, which allows it to move only a certain distance at a time, and this distance must be exactly equal to the interval between one vertical row of pins o^9 and the next. The mechanism of the escapement is composed of two rows of pins, x^{91}, projecting from the inner surface of the ring x^9, near its top edge, as seen in Figs. 19, 20, and 29, the latter figure representing a detached inside view of a portion of said ring with the pins x^{91}. These pins are set in the manner of a pin-wheel escapement of a clock, those in the lower row being between those in the upper row, as seen in Fig. 29.

The piece acting as a pallet is the hook-shaped end n^9 of the vertical bar m^9, which slides up and down in suitable bearings near the outer end of the frame j^9. When the hook n^9 is down it comes in contact with one of the pins x^{91} in the lower row, and prevents the frame j^9 following the action of the weight r^{91}; but as soon as the bar m^9 is raised the hook escapes from the pin in the lowest row, and the frame j^9 rotates until said hook strikes the next succeeding pin in the upper row, and if the bar is again depressed the hook escapes from the upper pin, and allows the frame to rotate until it (the hook) is brought up against the next succeeding pin in the lowest row. Thus, it will be seen, the frame j^9 is permitted to rotate from one pin x^{91} to the other for every up or down motion of the bar m^9. The upward motion of this bar is made dependent upon the register-levers h^9, each of which is provided with a tooth or projection, h^{95}, (see Fig. 19½,) which catches in a notch, m^{91}, in the outer edge of the bar m^9, and the downward motion of said bar is produced by a spring, p^9. Thus, it will be seen, whenever one or more of the register-levers h^9 are depressed at their inner ends, and consequently raised at their points, the bar m^9 will rise, and the frame j^9 moves from one pin x^{91} in the lower to one in the upper row, and so soon as the register-levers h^9 recede the bar m^9 is depressed by the action of the spring p^9, and the frame j^9 moves again from the pin in the upper to the next succeeding pin in the lower row. The register-levers are acted upon by the coupling-levers g^9, the inner ends of which rest each upon one of the rings on the inner ends of said register-levers, while their other ends bear against the projections on the slides f^{94}, as previously described, and shown in Fig. 20 of the drawings. Thus it will be seen that, no matter in whatever portion of the circle the frame j^9, with the register-levers, may be, as respects their outer ends, the coupling-levers g^9 will always be able to act upon them, because they continue to press upon some part of the rings at their inner ends. The manner of transmitting the motion of the keys L to the register-levers h^9, and through them upon the register-pins o^9, can now be seen. By depressing the first key, L*, for instance, as seen in Fig. 3, the slide b^9 is moved along, upon which are three engaging-points, and accordingly three of the levers d^9 are acted upon. These pull three trackers, the motion of which is transmitted to the three lower register-levers h^9 by the action of the bell-cranks f^9 on the slides f^{94}, and through them on the outer ends of the coupling-levers g^9, as clearly shown in Figs. 2 and 20. The outer ends of the register-levers are by this movement brought in such a position as to interfere with the inner ends of the register-pins o^9, and the bar m^9 being raised at the same moment, the escapement acts and the frame g^9 is allowed to move along. As the motion of the frame takes place the beveled ends of the three raised levers h^9 will strike three pins in the next vertical row opposite to which the frame is now brought up by the escapement, and three pins o^9 are pushed out, as shown in Figs. 2 and 20. By removing the

finger off the key the register-levers are allowed to fall back, the escapement-bar m^9 drops down and is caught by an escapement-pin of the lowest row, a second movement of the frame j^9 takes place, moving the beveled ends of the register-levers so as to stand half-way between two vertical rows of the register-pins o^9, for it will be evident that if this were not done the vertical movement of the register-levers h^9 would be interfered with by said pins. If the same or any other key is then depressed another set of the levers will take place, according to any particular combination required to give the indicators of the next letter required in the composition, and the proper pins o^9 will be pushed out in the next vertical row in the same manner as above described. In this way the register-levers will sweep round the whole interior of the registering-wheel until they arrive at the division-plate or standard s^9, upon which the levers f^9 and g^9 are affixed. At this place a warning will be given upon a bell, a^0, which may be applied below the table, as shown in Figs. 3 and 4. The clapper of this bell is connected to a toe, a^{01}, which projects through the table, and when the frame j^9 has completed its circuit it passes said toe and causes the clapper to strike the bell. Whenever this takes place the register-wheel contains a record of a number of letters equal to the number of vertical rows in which pins have been pushed out, and on hearing the signal the compositor must stop playing the keys. The letters thus indicated will all be delivered in regular order in the channel f without further attention on the part of the compositor.

It now remains to describe, in connection with this part, the mechanism for and the manner in which the pins o^9 act upon the indicators and effect their setting.

The position of the register-wheel is seen in Fig. 1, and also in Figs. 2, 3, and 20. It is suspended upon the same stationary axis with the carrying-wheel J, and is beneath it. It has a rotary motion in the same direction with the carrying-wheel, and it is moved at the proper time and to the right distance for giving the set to the indicators. A lever, v^9, with a long hub at its inner end, is fitted on the central axis and made to turn freely thereon. This lever carries at its outer end a roller, w^9, and a spiral spring, w^{94}, acts on the lever in such a manner that the same has a tendency to swing in the direction of the arrow marked near it in Figs. 1 and 19, and by these means the roller w^9 is held in contact with the cam w^6, which produces the desired vibrating motion of the lever v^9. Said lever also carries a pawl, u^9, which engages with teeth cut upon the periphery of the register-wheel, as clearly shown in Figs. 1 and 19. When the lever is forced back in the direction opposite to the arrow marked near it the pawl slides over the teeth of the register-wheel, which is prevented from turning back by a stop-pawl, v^{91}; but when the lever follows the action of the spring w^{94}, and swings in the direction of the arrow marked on it, the pawl engages with the teeth of the register-wheel, and imparts to it a rotary motion in the same direction in which the carrying-wheel rotates.

The cam w^6 is secured to the upright shaft w^{65}, which carries the pinion k, by which motion is imparted to the carrier-wheel J, and it is so shaped that the register-wheel is propelled once for each conveyer on the carrying-wheel. By the motion thus imparted to the register-wheel R the pins o^9, (which have been pushed out by the action of the frame j^9,) moving in the opposite direction to the register-wheel, are brought in contact, one set after the other, with inclined planes k^{01}, on the outer ends of plates k^0, which extends from rods m^0, as shown in Figs. 18^B, 24, 28, and 28½. Said inclined planes are formed by turning up a lip on the inner edge of the plates k^0, and the rods m^0 are parallel to each other, their number being made to correspond with the number of indicators, and also with the number of pins o^9 in a vertical row. They are placed one above the other, as shown particularly in Fig. 2 of the drawings, where their position in relation to the register-wheel and to the conveyers can be seen. They have their bearings in a frame, k^{02}, which is secured to the bed of the machine, and secured to their outer ends are the indicators e^{7*}, which act on the rails of the indicator-points of the setting-conveyers.

From each of the rods m^0 projects a small pin, m^{01}, and springs m^{02}, bearing on these pins, have a tendency to turn these rods down in the direction of the arrow marked near them in Fig. 28. Said springs are secured in a post or plate, m^{03}, rising from the frame k^{02}, and the downward motion of the rods m^0 is arrested by the indicators e^{7*} coming in contact with studs which project from the outer surface of the frame k^{02}, as seen in Fig. 2. These studs are in such a position that they retain the indicators in a horizontal position, and if a setting-conveyer passes the indicators while they retain this horizontal position the tails of the indicator-points on said conveyer pass above the same without coming in contact with them. But if one or more of the register-pins o^9 in the register-wheel are forced out, and said register-wheel is turned so that the projecting pin or pins come in contact with one or more of the inclined planes k^{03}, as indicated in Fig. 28½, the rods m^0 are turned in the direction opposite the arrow, marked near them in Fig. 28, or against the force of the springs, and the indicators e^{7*} are tilted, causing them to assume an upwardly-inclined position. If a setting-conveyer passes the indicators in this position, those of the indicator-points the tails of which come in contact with the inclined indicators are turned down, and by these means the set given to the register-pins o^9 is transmitted to the indicator-points of the con-

veyers. For instance, if, to indicate a certain letter or type, the three lowest in a row of register-pins o^9 are pushed out, if the register-wheel turns so that this row of register-pins is brought opposite the inclined planes k^{01} on the inner ends of the rods m^0, all these rods will remain stationary except the three lowest, and the indicators attached to these rods will be tilted upward. By these means the three lowest of the indicator-points of the first setting-conveyer which passes the indicators will be turned down, and if said conveyer arrives opposite to the place of the excavated rim which corresponds to the set of its indicator-points it will fall in and receive a letter from one of the radiating type-cases. The indicators, it will be seen, are placed just at the entrance of the radiating type-channels, so that the indicator-points upon the setting-conveyers receive their set before they reach the types. The whole of this part of the mechanism is so timed as to bring the indicators into action just before a conveyer approaches, and it will be noticed that the tails of the indicator-points upon the distributing-conveyers are cut off, so that all the distributing-conveyers will pass the indicators e^{7*} without receiving a set. The tails of the indicator-points on a setting-conveyer pass by the indicators e^{7*}, and receive their set while the register-pins o^9 are under the inclined planes k^{01}. As soon as the register-wheel turns the next step the register-pins in one row clear the inclined planes, and the indicators are allowed to reassume their horizontal position. The next row of register-pins o^9 now approaches, and another set is given, and so on continually so long as there are any register-pins to act.

As soon as the register-pins have acted they must be pushed in again. This is accomplished by a beveled plate, s^{10}, standing close to the outer circumference or face of the register-wheel, as seen in Figs. 19, 20, and extending up to the height of the upper circle of pins. As the wheel passes all projecting pins are pushed in. A similar plate, s^{10*}, heading in the opposite direction and situated close to the inner periphery of the register-wheel, prevents the pins o^9 being pushed in any farther than desirable.

From this description it will be seen that for each letter indicated by depressing one of the keys L the frame j^9 advances one step in the direction opposite to that in which the carrying-wheel moves, and for each sign transmitted by the register-wheel to a setting-conveyer said register-wheel turns one step in the same direction in which the carrying-wheel moves, and in turning in this direction it carries the frame j^9 back with it. If the compositor stops, therefore, to depress any more keys or to register any more signs on the register-wheel the frame j^9 will turn with said register-wheel until it comes close up to the partition-plate or standard s^9. At that place the motion of the register-wheel must stop, and in order to effect this purpose automatically a bell-crank lever, w^{91}, is pivoted to the table of the machine in such a position that the end of one of its arms projects beyond the inner periphery of the register-wheel, whereas its other arm bears on one end of a spring or yielding lever, w^{92}. The other end of this spring or yielding lever bears on a pin descending from the tail of the pawl w^9, and a light coiled spring, w^{93}, keeps the point of said pawl in contact with the teeth of the register-wheel. If the register-wheel has traveled far enough to transmit all the signs which it can transmit, the frame j^9 strikes against the inner radiating arm of the bell-crank lever w^{91}, and forces the end of the yielding lever or spring w^{92} off from the register-wheel. By this operation the tail of the pawl w^9 is forced toward the center, the pawl is disengaged from the teeth of the register-wheel, and the motion of said wheel stops. From this arrangement it will be understood that the compositor is not obliged to continue to operate the register-levers until he has worked them round to the alarm-bell; on the contrary, he composes fast or slow, and may work quite irregularly, stopping at frequent intervals to set his lines into columns, to space, and to justify, as may be required. Thus, while composing, he is working the register-levers and frame j^9 along in one direction contrary to the motion of the register-wheel; but if he works no faster than the register-wheel moves the levers and frame will remain about in one place; if faster, he will work the frame round to the alarm-bell, and then he must stop, and as soon as he stops the levers and frame are carried along with the register-wheel, because they are both connected by the escapement, and if the frame is allowed to go clear back to the stop-lever w^{92} the operation of setting ceases. The setting-conveyers will merely pass round empty, but the distributing-conveyers will, if there be type on the galley W, go on independently. The number of conveyers on the carrying-wheel and its speed may, however, be increased to such an extent that the composer has no time to space and justify, and in that case a second person is charged with this part of the work.

The operation of this machine and the mechanism by which motion is imparted to its different working parts is as follows: The main shaft S is to be set in motion by some suitable power, where it will be maintained in revolution with the proper, and as near as may be, uniform speed. This puts the great type-carrying wheel J also in motion, with all the various parts connected therewith and operated as has already been described. If a column of dead matter has been placed upon the distributing-table, properly set up and blocked, distribution will commence by setting the stop z^2 so as to release the lever w^2, (shown in Fig. 4,) and to allow this lever to follow the curves of its cam w^2. By means of the pawl-levers s^2

the ratchet m^2 will begin to feed up the line of type, provided that has been raised into the channel a. If not, no action will take place until the raising of the line has been done by the action of the tilting frames x and o^3, as shown in Figs. 5, 6, 7, and 8. All the motions are so timed that the moment the first type presents itself at the distributing-stand X the latch y^a will be in position to press said type against the levers z^3, the graduated stop c^4 having just previously been moved up to the mouth of the type-channel. At this moment the end of the arm u^2, Fig. 4, has ascended the inclined side of its cam w^2, and rests upon the level surface of the same. The type is pressed up against the levers z^3, and such levers as are not opposite to nicks sink in. The cams on the shaft j^{14} continue to rotate in the direction of the arrow marked thereon in Fig. 9, and by the action of the type on the levers z^3 r^4 the indicators e^y on the ends of the segments w^{43} are set according to the nicks in said type. In this position the levers are held by a hook, u^4, operated by a cam on the shaft j^{14}, and at the conclusion of these motions the cam w^2 has revolved so that a feed takes place, the click g^2 driving along the line of type, and this, in turn, pushing the stop c^4 until it is arrested by coming in contact with the shoulders of the heads p^4 of the levers z^3, while at the same time the latch y^a is forced back and made to release the line of type, as shown in Fig. 12. The feed, as has already been mentioned, is performed by a weight or spring; but before the type is discharged the line is relieved from this by the opposite curve of the cam acting upon the lever u^2, and it rides upon the level surface of the edge of the cam-wheels. The forked ends of the discharging-pusher k^4 now approach the type, striking it at three places, and push it off the platform upon which it stood onto a distributing-conveyer, which has just previously been caught by the detaining-hook y^{31}. (See Fig. 9.) As soon as the discharge is effected the stop c^4 moves back to its original position, the next type is pressed up against the levers z^3, and the same operation is repeated. In order to insure the proper arrival of a distributing-conveyer at the moment the discharging-pusher k^4 comes into action the shafts S and T are geared together by equal wheels o and n. They therefore revolve alike. As the shaft S propels the type-carrying wheel, the movement of the latter must be so timed as to bring a distributing-conveyer into position a little before each action of the discharge-pusher, which takes place twice for each revolution of the shaft T. On the carrying-wheel eighteen distributing-conveyers are shown, though this number may be varied at pleasure. The revolutions of said wheel are therefore as one to eighteen of the shaft T. The starting-points of the conveyers being at equal distances apart, and the wheel set so as to bring that point opposite the detaining-hook at the discharge-opening, when the pusher is out the conveyer is always caught in time to receive its type. The position of the indicators e^7 is such as to effect the set of the indicating-points on the distributing-conveyer as it approaches the discharge-opening and before it is caught by the detaining-hook. After a type is received the conveyer moves on with the carrying-wheel, being returned to its advanced position by the tail of the lever u^{24} coming in contact with the stationary stop u^{25}, and it carries the type, firmly held by the spring d^{18}, until it has arrived at the mouth of the proper channel or type-case, at which place there is an excavation or set of excavations in the grooves of the rim m^5, corresponding to the set given to the indicating-points at starting, and which represent the letter or character carried. The conveyer is accordingly permitted to fall in, and its projection x^{25} is caught by the detaining-hook x^7, holding it there until the type is discharged into the case by the pusher d^{24}, as previously explained.

The operation of the composing mechanism is as follows: The compositor stands in front of the table of keys L, Fig. 1, the galley M being at the extreme left and his copy before him in a convenient position for reading. The width of the extended column of page is fixed by the gage-plate in the galley and the length of each line to correspond by the gage f^{10}. The compositor now commences registering the letters by operating upon the keys. This he may do without any regard to regularity or speed. If he presses down the keys faster than the carrier-wheel delivers the type he records signs upon the register-wheel ahead of this delivery, as already described, and the speed of the carrier-wheel may be such that he is able to do this, though the number of conveyers and the speed of said wheel can be increased so that the compositor will not be able to register many signs ahead. In continuous working the revolving frame having the register-levers h^9 may be worked round so as to stand about midway between its two extreme points of motion, as it will be remembered that the same cannot complete its revolution about the register-ring. When in this position enough letters will have been recorded to allow of time to stop and justify the lines by the insertion of the thin spaces, and make other corrections, as may be needed, or, if those duties are attended to by a second person, to look after his machine and to take a little rest. The type will now begin to arrive at the setting-channel and be regularly deposited thereon in the proper order and position. In Fig. 1 a portion of a column is represented with its top line pressed in by the follower e^{10}, and a new line ready to be cut off by the action of the gage f^{10}. The sharp end of this gage, pressing between the types, separates off a line of the proper length for the width of the column. Now is the time to space the letters or words, because it may

happen that the gage may strike against a type instead of meeting the line at the point dividing two types, which it must accurately do in order to make correct width of column. Thin spaces are for this purpose inserted, being taken from the proper case as wanted. This done the gage f^{10} cuts off the line at the right length, and it may then be sent in upon the galley. For this purpose the follower e^{10} is moved back and a channel is formed to receive the new line. The compositor, with a bodkin or thin plate of metal in his hand, drives the line into place, and the column is forced down as before. The thin spaces or quadrats are introduced in like manner for filling out a line, when a sentence terminates short of the width of the column, or whenever such spaces are required.

The italic type, numerals, and algebraic signs are or may be introduced into the cases, for it is evident that any type channel or case may be devoted to type of any character by giving such type or character an appropriate set of nicks and corresponding indices in the excavated rim at such channel, as already set forth.

The machine may be devoted wholly either to setting or distributing, as the type-cases are set upon the bed in sections, and may be removed for different ones to be introduced without interfering with any portion of the operating mechanism. When any machine is devoted, therefore, exclusively to either branch it may be arranged to perform an increased amount of work. It is also obvious that various changes might be made in the arrangement and introduction of the parts, and in the special combinations hereinafter described, without changing at all the general character of the machine—as, for instance, the excavated rim, instead of being placed outside the conveyers, might be placed inside, and, instead of being provided with slotted excavations passing through it, might be made with recesses just deep enough for the indicator-points of the conveyers to sink in far enough to allow them to open to the required distance to be engaged by the detaining-hooks x^7 and y^{31}.

Having thus described our invention, we claim as new and desire to secure by Letters Patent—

1. The conveyers c d, in combination with the links c^{16} d^{16}, constructed and operating substantially as and for the purpose set forth.

2. Giving to the conveyers a direct motion in the direction of the indicator-points upon them by means substantially such as herein described, or any other equivalent means, for the purpose set forth.

3. The method herein described of compelling the conveyers, after they have been arrested, to overtake and reassume their original position on the carrier-wheel, consisting of the lever u^{24} and studs u^{25}, as specified.

4. The mechanism, substantially as set forth, consisting of the arm u^{29} and spring c^{28}, in combination with the lever u^{24} and conveyers c or d, or any equivalent thereof, for the purpose of moving said conveyers back at the proper intervals.

5. The sectional flange u^{17} on the carrying-wheel J, in combination with the pin u^{16}, projecting from the edge of the conveyers, applied and operating substantially as and for the purpose described.

6. Placing the excavated rim on the outside of the conveyers, instead of on the inside, substantially as and for the purpose set forth.

7. The rail j^{15}, applied in combination with the conveyers c d and sectional excavated rim m^5, substantially as described, so that free access can be had to the conveyers and the labor of making the excavated rim is reduced.

8. The projections k^{25} k^{26} on the pusher-cord k^{17}, to operate in combination with the tilting-lever s^7 and spring-stops s^{18} s^{19}, substantially as and for the purpose set forth.

9. The arrangement of cams u^{15}, on the under surface of the carrier-wheel J, to operate in combination with the levers c^{20} d^{20} and pushers c^{24} d^{24}, substantially in the manner and for the purpose specified.

10. The griper-springs c^{18} d^{18} on the conveyers, in combination with studs u^{02} y^{31} and with suitable mechanism for pushing the types out of the type cases or channels a, constructed and operating substantially as and for the purpose set forth.

11. The revolving receiver R^2, applied in combination with the carrying-wheel J and conveyers c d, substantially in the manner herein specified, so that the conveyers can deposit their type without stopping.

12. The type-levers z^3, with quadrants r^4, in combination with segments w^{43} and indicators e^7, constructed and operating substantially as and for the purpose set forth.

13. The latch y^a, or any equivalent device, applied in combination with the type-channel a^y and the type-levers z^3, substantially as herein described, whereby the types are pressed up against the edges of the type-levers instead of pressing said levers against the types.

14. The sliding stop c^4, in combination with the type-levers z^3 and with the channel a^y, constructed and operating substantially as and for the purpose described.

15. The dog u^4, or its mechanical equivalent, applied in combination with the mechanism for transmitting the set of the type-levers to the indicators in such a manner that the indicators which are not to act on a certain conveyer are positively held until the conveyer has passed.

16. The apron h^4 and stud h^{41}, in combination with the sliding stop c^4 and type-levers z^3, applied substantially as herein described, for the purpose of regulating the motion of said sliding stop when a thin space is presented.

17. Producing the set of the one class of

conveyers from the inside, and that of the other class from the outside, substantially as and for the purpose set forth.

18. The rods m^0, with plates k^0 k^{01} on one and indicators e^{7*} on the opposite end, substantially as described, for the purpose of transmitting the desired set from the register-wheel to the indicator-points of the conveyers.

The above specification of our invention signed by us this 9th day of June, 1865.

HENRY W. ALDEN.
WILLIAM MACKAY.

Witnesses:
W. HAUFF,
M. M. LIVINGSTON.