

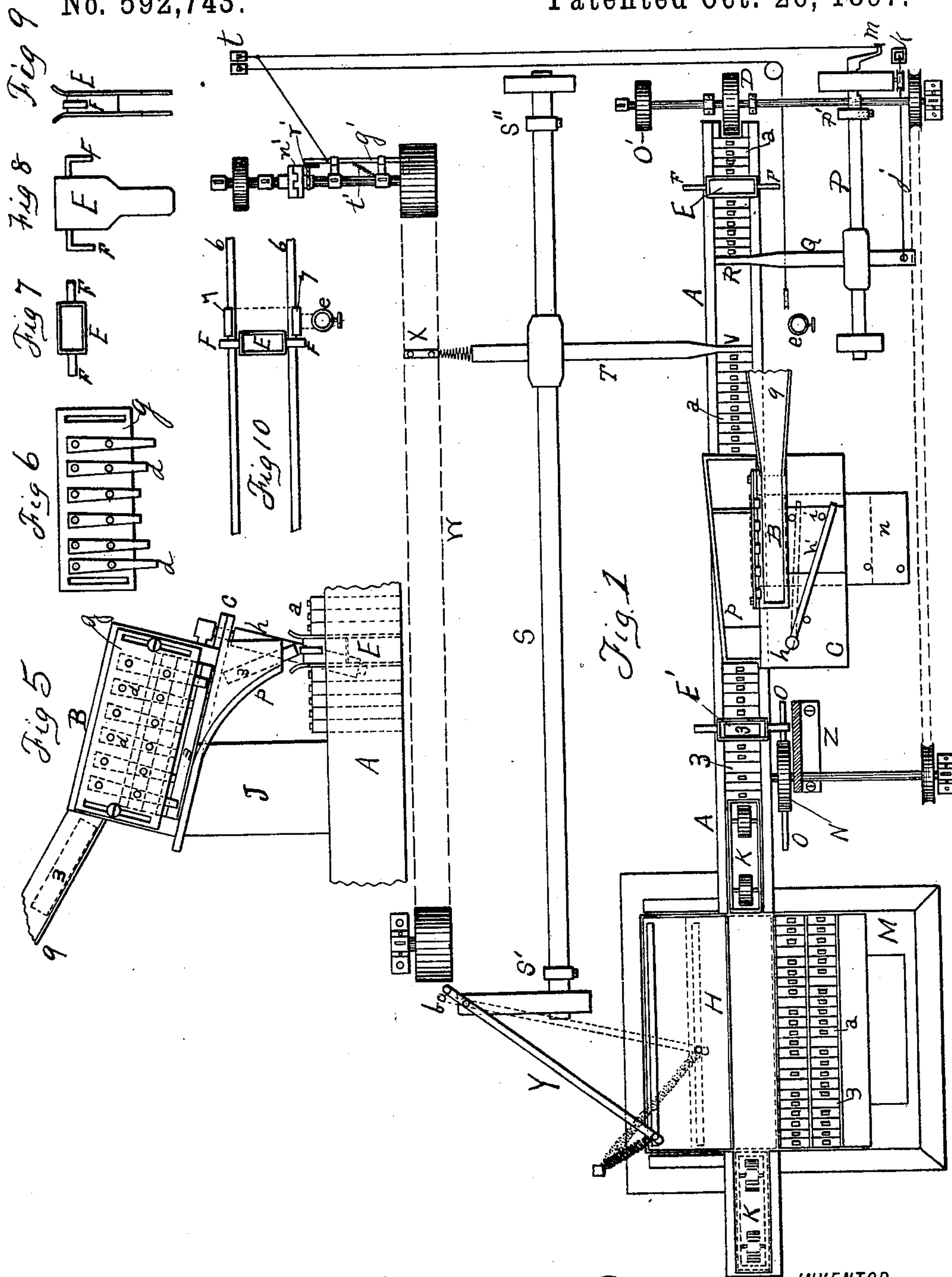
(No Model.)

2 Sheets—Sheet 1.

C. W. BOWRON.
TYPE JUSTIFYING MACHINE.

No. 592,743.

Patented Oct. 26, 1897.



WITNESSES:

Frank P. Miller
W. W. Chouinard

Charles W. Bowron

INVENTOR

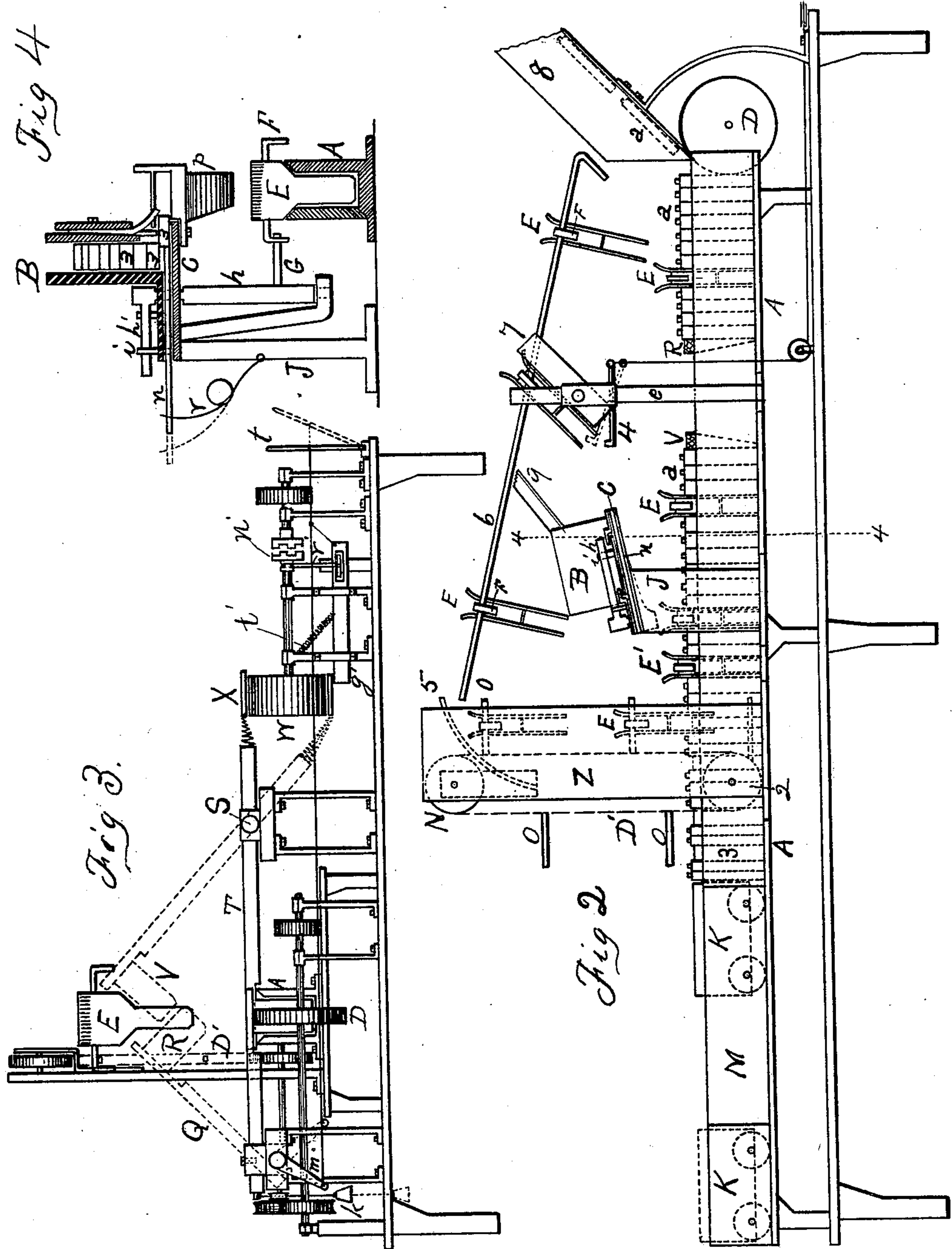
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2 Sheets—Sheet 2.

C. W. BOWRON.
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WITNESSES:
Frank P. Gillen
M. W. Chouinard

Charles W. Bowron INVENTOR

UNITED STATES PATENT OFFICE.

CHARLES W. BOWRON, OF OSHKOSH, WISCONSIN.

TYPE-JUSTIFYING MACHINE.

SPECIFICATION forming part of Letters Patent No. 592,743, dated October 26, 1897.

Application filed September 14, 1896. Serial No. 605,809. (No model.)

To all whom it may concern:

Be it known that I, CHARLES W. BOWRON, a citizen of the United States, residing at Oshkosh, in the county of Winnebago and State of Wisconsin, have invented certain new and useful Improvements in Type-Justifying Machines; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

My invention relates to an attachment to type-setting machines for the purpose of justifying into lines of desired length the types assembled from such type-setting machine. As the words of the language are of various lengths and the letters are of different widths, it is obvious that in order to adjust assembled types into lines of equal length it is necessary to employ space-types of different thicknesses between the words. It is also an obvious fact in mechanism and is well understood in the printer's art that the exact amount of space-filling required between the words in order to correctly justify type cannot be definitely known until the types forming the words contained in the length of the line have been assembled and the deficiency ascertained.

The object of my invention is to provide automatic mechanical means for keeping the words separated as a line of type is being set, next ascertaining the amount of space-filling required between the words, and then, by automatic means, inserting the required thicknesses of space-types between the words so kept separated.

My invention consists, in part, of a removable hollow false space constructed so as to allow the true or permanent space to pass into and through it, temporarily placed between the words, to keep them separated and apart as the types are assembled and into which removable hollow false space the true or permanent space-type, when ascertained and selected, is inserted. The hollow false space then being lifted or removed automatically from between the words leaves in its place the desired permanent space-type.

My invention consists, further, in the mechanical appliances for inserting between the words and removing therefrom the hollow false spaces and the means of inserting into the hollow false spaces the true and permanent spaces to be left between the words when the false spaces are removed. The process of ascertaining the thicknesses of spaces required, the calculation necessary to the perfect operation of my device, and the selection of suitable type-spaces, including their arrangement in proper order and the depositing them in such order in the hopper from which they are to be supplied to the machine, so as to secure automatic justification of type with the aid of my improved devices, are also a part of my invention and are essential features thereof.

There are now in general use types whose thicknesses are based on exact multiples of a given unit. These types are commonly used with type-setting machines. My spacing devices and mechanism for using them are adapted for use with type-setting machines and in connection with such multiple types. My mechanism with the hollow false spaces being arranged to be operated in connection with or as an attachment to such type-setting machine, the operator of the machine assembles the types by devices and methods already in vogue, inserting between the words, as the types are assembled into my machine by means hereinafter to be described, the removable hollow false spaces of my invention. An indicator discloses to the operator the number of units of type assembled. The number of units in a line being known, the difference between the number of units of type assembled and the total units in a line discloses the number of units of space required to be filled in between the words to justify the line even, and therefrom the operator calculates (from the number of words and the total amount of remaining space in the line to be filled) the number and thicknesses of the permanent spaces necessary to be employed, as per the following example: In one of the sizes of the above-mentioned type it requires one hundred and thirty units to fill a line of ordinary length used in the newspaper—viz., thirteen ems pica. Presuming that the operator's indicator disclosed the

fact that he had assembled types of words to the amount of one hundred and twenty units, the operator would know by mental calculation that it required ten units more to make
 5 a complete line. Presuming, for example, that five hollow false spaces have been inserted between the words of the one hundred and twenty units of type assembled, the operator further calculates that it requires five
 10 space-types of two units each to be inserted in place of the five hollow false spaces in order to complete the one hundred and thirty units in the line and leave it justified. If there were four spaces between the words, the operator calculates that it would require two
 15 spaces of three units each and two spaces of two units each to be inserted in place of the four false spaces. If there were six spaces to be supplied between the words, the operator calculates that it would require four
 20 spaces of two units each and two spaces of one unit each to be inserted in place of the six hollow false spaces, and so on.

A description of the construction and mechanical operation of my device in applying this principle to the automatic justification of type is as follows:

Figure 1 in the accompanying drawings represents a top plan view of the automatic type-justifying attachment. Fig. 2 is a side view
 30 of the type-channel and the parts that operate to insert the hollow false spaces between the words and remove them after the correct permanent spaces have been dropped into the false spaces and also the apparatus for
 35 assembling the permanent spaces and dropping them into the hollow false spaces. Fig. 3 is an end view of the type-justifying machine as seen from the right of Figs. 1 and 2, showing in dotted lines the alternate positions of some parts of the mechanism. Fig.
 40 4 is a transverse vertical section on line 4 4 of Fig. 2, looking toward the left, showing the type-channel and permanent-space hopper and apparatus for discharging the true or
 45 permanent space-types into the hollow of the false spaces. Fig. 5 is a side view of the permanent-space hopper and related devices. Fig. 6 shows elastic guards attached to the adjustable hopper-plate. Figs. 7, 8, and 9
 50 are respectively a top, side, and edge views of the hollow false space. Fig. 10 is a top view of a portion of guideways with stop along which the hollow false spaces assemble
 55 when not in use.

A description of my machine in particularity, having reference to accompanying drawings, is as follows:

A is the type-channel in which the types
 60 are assembled as discharged from the type-setting machine and in and along which the assembled words, with the removable hollow false spaces between them, move in the process of justification. It is slightly inclined
 65 downward toward wheel D.

a a a are the types of words.

D is a wheel at the receiving end of the

type-channel A, which in revolving presses the types into correct position in the channel as fast as received from the type-setting machine. 70

Spout 8 leads from the type-setting machine to type-channel A and along it descend the types *a a* as discharged from the type-setting machine, the types falling endwise in front
 75 of wheel D, which presses them into erect and compact position in channel A. An arm T, provided with a head V, adapted to enter the type-channel A loosely, is mounted movably on a fixed rod S, parallel with the type-channel, and the arm T is connected flexibly
 80 to the endless belt W conveniently by a coiled elastic wire and flange or clasp X. This arm T by its head V is adapted to push the line of type forward in the type-channel, 85 actuated by the endless belt W. Adjustable stops S' and S'' at either end of the rod S limit the reciprocal motion of the arm T.

Q is a reciprocally-moving arm sliding on rock-shaft P, to which it is splined, its head
 90 R fitting loosely into the type-channel A and held pressed against the forward end of the succeeding line of type in progress of assembling by weight *k*, attached to a cord *j*, secured to the arm and running over a pulley, as
 95 shown.

m is a crank on the end of rock-shaft P for the purpose of rocking it and raising head R out of the channel A when the unjustified line is completed. Crank *m* is connected to
 100 the operator's key or lever *t* by a cord or wire, as shown.

B is the true or permanent space hopper in which the correct permanent spaces 3 3 are assembled in proper order when ascertained. 105

C is an inclined plate upon which the space-hopper B is fastened, the plate being supported by standard J, Figs. 2, 4, and 5.

Spout 9 leads from the space-boxes in the type-setting machine, and down it the true
 110 or permanent spaces 3 3, when ascertained and selected, descend into space-hopper B.

Z is a standard which holds pulleys N and 2, over which runs an upright endless belt provided with fingers O, which catch the
 115 hollow false spaces by one of their ears F and lifts them out of the type-channel A and from between the words.

K is a slug provided with wheels arranged to travel in the inclined type-channel A, which
 120 slug is adapted by gravity to bear against and hold the forward end of the type-line erect as the line is moved along the type-channel A.

L is a recess, practically a continuation of
 125 the channel A, into which traveling slug K is forced by the forward pressure of the line of type in the channel A.

M is a table or galley to receive the justified lines of type in their order, said galley extending laterally from channel A and of sufficient width to receive the justified lines in column form. 130

H is a slide opposite to galley M and of

equal length, being the length of a justified line of type. The side walls of channel A are absent between galley M and slide H, leaving a slug in the galley or a justified line to form one side of the type-support and the face of slide H to form the other side of the type-support, so that when a justified line is brought exactly between them slide H is operated to push the line sidewise into galley M. Slide H moves on a stationary bed-plate between guide-plates on two sides of it. Along its rear edge is a slot into which fits loosely a pin fixed to lever Y. Lever Y is actuated by the flange X on endless belt W pressing against pin *b*, moving lever Y into the position shown in the dotted lines in Fig. 1, thus forcing slide H against the line of type in front of it and carrying the line of type sidewise into galley M. Slide H is retrieved to place by a spring on the under side as soon as pin *b* is released by flange X in the further movement of belt W.

E E E are removable hollow false spaces inserted between the words as they are assembled and into which the permanent true spaces 3 3 are dropped from the space-hopper B as the assembled types are moved along in the type-channel A beneath it. The removable hollow false space consists of a hollow member formed by two side plates at sufficient distance apart to admit of the passage of a space-type between them secured to each other along portions of their edges by edged plates to form a hollow frame. The lower portion of the side plates is contracted, so as to fit loosely into the type-channel in and along which the false space moves, while the edge plates extend from the top downward only to the point of the cutting away of the side plates. The side plates are flared outwardly at their tops in order to better receive the space-type dropped into the hollow false space; but this precise construction is not necessary to effective operation. The hollow false space may be cast in one solid piece and in any other shape necessary to the related mechanism with which it is employed or may be constructed in any other manner. It is only necessary that opposite surfaces shall afford sufficient resistance to keep the words of types separated and that a space be left between those resisting surfaces sufficient for a space-type.

F F are ears which consist of members rigidly secured to the body of the removable hollow false space E and project laterally therefrom and preferably are turned downward a little at a short distance from the body of the false space. It is not necessary to turn down the ears F F and it may not be necessary to have more than one ear, but in this particular construction I employ two ears, one on each side, in adaptation to other related constructions.

E' E', Fig. 1, represent some hollow false spaces containing the true or permanent spaces 3 3 that have been dropped into them from the space-hopper B. The means for ac-

tuating endless belt W and throwing it in and out of gear are shown in Figs. 1 and 3. Between the drive-wheel R' and the pulley on which belt W revolves are a pair of clutches, one of which, *n'*, slides slightly on its shaft, to which it is splined. Rod *r'*, having a square head, is pivoted through its head at *m'*, the other end forming a collar fitting into a groove in the shoulder of clutch *n'*. The square head on the lower end of rod *r'* fits loosely into a slot in the lever *g'*, which lever passes through mortises in the shaft-supports, as shown. The mortises allow lever *g'* to move up and down, and the slot into which the square head of rod *r'* fits allows lever *g'* to also move slightly endwise. The spiral spring *t'*, connecting lever *g'* and the shaft-support, as shown, tends to keep lever *g'* pulled upward and forward under belt W. When the flange X on belt W passes along on the under side in returning arm T in a tilted position back to stop S', Fig. 1, on arriving at the bottom of the pulley, as shown in dotted lines, Fig. 3, the flange X strikes an incline or shoe on lever *g'*, pressing the lever downward, which actuates rod *r'* to move clutch *n'* backward on the shaft and separate the clutches, thus throwing endless belt W out of gear. When the operator desires to throw the belt W in gear, he operates lever *t*, from which a rod or wire runs to lever *g'*, Figs. 1 and 3, which pulls lever *g'* endwise until it clears flange X, when the coiled spring *t'* raises the lever *g'*, throwing clutch *n'* forward into gear. Upon the release of lever *t* spring *t'* pulls lever *g'* forward endwise into position to be operated on again by flange X, as before.

The means for inserting the removable hollow false spaces between the words as the types are assembled are more plainly shown in Fig. 2. Guide rails or ways 6 consist of two parallel inclined tracks at sufficient distance apart to permit the hollow false spaces E to slide between them while suspended on the rails by their ears F F. Guide-rails 6 are supported by arms or brackets fixed to standard *e*. The tops of these brackets are allowed to project slightly above the guide-rails, forming projection-stops 7, Fig. 10. The ears F F on the hollow false spaces come against these stops 7, thus preventing the hollow false spaces from further descending the guide-rails. Thus the hollow false spaces assemble, when not in use, on guide rails 6 behind stops 7, over which stops each false space is lifted and allowed to escape down the further incline of the guideways and into channel A when needed by the operator touching a key, which operates kicker 4 by means of a connecting-wire. A top plan view of guide ways or rails 6 at the point of stops 7 is shown in Fig. 10. Kicker 4 is pivoted to standard *e* in such manner that when the operator touches the key to which the wire from one end of the kicker is attached it raises the other end of the kicker, which strikes the bottom of the nearest hollow false space and

elevates it sufficiently to clear the stops 7 and slide down the guide-rails and off the end of the rails into type-channel A, the wheel D operating upon the false space the same as upon a type, pressing it into proper position in the type-channel, as shown in Fig. 2. Wheel O' drives the shaft which carries wheel D.

The means for inserting the true or permanent spaces, when ascertained and selected, in the hollow false spaces are as follows: B, Fig. 4, is a vertical sectional view of the permanent-space hopper, and 3 3 are permanent space-types loose within it. An actuating-pin G is rigidly fixed in the vertical rock-shaft *h*. Rock-shaft *h* is footed in the frame and has a bearing also in plate C. Above plate C rock-shaft *h* is provided with a laterally-projecting finger *h'*, which impinges on pin *i*, fixed in pusher *n* and forces pusher *n* laterally, which in turn pushes the bottom space-type in hopper B sidewise through a lateral opening into the descending chute *p*, down which the space-type descends endwise into the hollow false space E, as shown in Fig. 5. Space-hopper B has an opening along its lower lateral edge on one side next to plate C, through which opening pusher *n* operates to push the space-types sidewise through a corresponding lateral opening on the opposite side of hopper B sufficiently large to admit of the passage outwardly of the thickest space-type necessary in justification. It should be understood that as the line of assembled types, with the hollow false spaces between the words, moves along type-channel A one of the ears F on each hollow false space as it passes impinges upon actuating-pin G and operates the parts described to discharge a corresponding permanent space-type into itself. The parts are so related and adjusted that the space-type is pushed out of hopper B and slides endwise down chute *p* at the exact instant the hollow false space which actuates the parts is directly beneath the mouth of chute *p* and in position to receive the permanent space-type thus discharged from hopper B. Fig. 4 shows an ear of a hollow false space in the act of impinging on actuating-pin G and also pusher *n* in the act of forcing a permanent space-type out of hopper B as the result of such operation. Fig. 5 shows the next stage of the operation, the permanent space-type descending chute *p* endwise into hollow false space E. Spring *r* retrieves pusher *n* to place, when ear F on hollow false space E is released from pin G. As the permanent spaces used are of different thicknesses and as two or more thin ones would be liable to come to the bottom of the hopper together and might escape laterally from the hopper together when the lower one is being pushed therefrom, I use the elastic guards *d d* of unequal lengths, projecting over the lateral opening in space-hopper B, so that when the bottom space is being pushed from the hopper it will force

only the longer guards away from the opening and allow the bottom space to escape, while the shorter guards will retain in place in the hopper all the space-types above the bottom space. Elastic guards *d d* are secured to adjustable plate *g*, which is attached to the side of hopper B by means of set-screws through slots in plate *g*. By adjusting plate *g* on hopper B the elastic guards *d d* can be made to project over the lateral opening in hopper B, so as to accomplish the result described. The adjustable plate *g*, with elastic guards attached, is shown in Fig. 6. Fig. 5 shows the adjustable plate *g* attached to the side of hopper B with elastic guards projecting downward over its lateral opening. Fig. 4 shows a bottom space-type passing through the lateral opening in hopper B, pushing the longer elastic guards *d d* outward to allow it to escape, while the shorter guards are shown retaining in the hopper the space-types above the bottom space-type. Fig. 4 also shows a cross-section of the type-channel A with a removable hollow false space E fitting in it. The side walls of the type-channel are beveled inwardly along their top edges, and the contacting edges of the hollow false space E conform to the interior contour of the channel, thereby better keeping the false space in place as it moves along the beveled edges of the channel. The edge plates of the hollow false space terminate on the bevel edges of the type-channel walls, and only the side plates of false space E project downward into the channel below the bevel.

The means for removing the hollow false spaces from between the words after the desired true or permanent space-types have been inserted in the false spaces are shown in Figs. 1 and 2. This is accomplished by a perpendicular endless belt D', revolving on wheels N and 2, supported by standard Z. Attached to the perpendicular belt D' are fingers O, which in ascending catch the several removable hollow false spaces E by their ears F and lift them until a sheer-rod 5, rigidly secured to standard Z, sheers the false spaces E off the fingers O onto guide rails or ways 6, upon which the false spaces E hang by their ears on each side and along which they descend and assemble behind stops 7, as already described. Belt D' is driven by a pulley and belt connecting with the shaft which carries wheel D, as shown in Fig. 1.

The successive operations of the machine as a whole in the justification of type into lines properly spaced are as follows: When ready for the initial operation, the head R of reciprocating arm Q is in the type-channel A, pressing against revolving wheel D, and traveling slug K is pressing against the front or opposite side of head R. Arm T is in an elevated position at stop S'', Fig. 1, as shown in dotted lines in Fig. 3, with endless belt W out of gear. The operator at the keyboard of the type-setting machine releases, in consecutive

order, the types of the word, which types descend along spout 8 into type-channel A, Fig. 2, the wheel D receiving each type as it descends, carrying it forward and pressing it into the line being assembled in the type-channel A. Head R recedes under the pressure of the assembling line of type as the number of types in the channel increases. At the end of each word the operator touches a key operating kicker 4, Fig. 2, thus raising one of the removable hollow false spaces E over projecting stops 7, Fig. 2, thus releasing the hollow false space. The hollow false space E thus released descends along the ways 6 and falls upright in the channel A in front of wheel D, which presses it into position behind the assembled types of the word, Fig. 2. This operation of assembling types in channel A and dropping the removable hollow false spaces between the words is continued until the indicator on the operator's machine shows that the number of units of type discharged into channel A nears the total number of units in a line, and, calculating, as described, the number and amount of units of permanent space-types necessary between the words to fill out or justify into a line the words thus assembled, the operator touches the proper space-type keys to discharge into the space-hopper B the desired space-types. Arm T has in the meantime been stationary in an elevated position at stop S'', as shown in dotted lines, Fig. 3. The operator presses lever *t*, attached by wires or connecting-rods to crank *m* on rock-shaft P and to lever *g'*, Fig. 1, which operation elevates head R and at the same time throws into gear the endless belt W. Head R when raised, being released from the pressure of the line of type in channel A, is pulled back to the stop P' on rock-shaft P by weight *k*, leaving traveling slug K pressed by gravity against the forward end of the line of type. Arm T descends, bringing head V into the type-channel A in front of wheel D, and in its forward movement, by reason of its attachment to endless belt W, arm T pushes the assembled words, with the removable hollow false spaces between them, along channel A, as shown in Fig. 1. As each of the removable hollow false spaces in the type-line passes under space-hopper B it operates the mechanism to discharge the proper space-type into itself, Figs. 4 and 5, as already described, and thus all the space-types in hopper B are dropped into respective removable hollow false spaces as they pass along in the type-channel beneath. With the further movement of the type-line along the channel A one of the fingers O, Figs. 1 and 2, catches under the hook or ear of each removable hollow false space as it approaches and elevates it by means of the elevating-belt D', revolving about pulleys N and 2, and discharges it upon guide rails or ways 6, Fig. 2, as already described, thus leaving between the words the true or permanent space-types the removable

hollow false spaces contained. When arm T reaches stop S' on rod S, Fig. 1, pressing the line of type before it, all the removable hollow false spaces in the line will have been withdrawn, leaving the true or permanent space-types in their stead between the words, the gravity-pressure of traveling slug K closing up the line as fast as the hollow false spaces are removed. Traveling slug K is pressed into recess L, of equal length, bringing the justified line of type exactly in front of and corresponding to the length of slide H. At this juncture, and while arm T is still pressing against the justified line of type, flange X on endless belt W strikes against pin *b*, operating arm Y, and pushes slide H against the line of type, carrying the justified line sidewise into galley M, as shown in the dotted lines, Fig. 1. Slide H returns to place by a spring-pressure. As flange X, to which arm T is yieldingly attached, passes to the under side of revolving belt W the arm T is tilted upward and carried back to stop S'' in an elevated position, at which point flange X impinges on lever *g'* to throw the endless belt out of gear, thus completing the operation. When arm T rises at stop S' after the justified line is moved sidewise into galley M, the type-channel A being clear, traveling slug K descends in and along the slightly-inclined type-channel A until it again comes in contact with head R. In the meantime by the release of the operator's lever *t*, attached by wire to crank *m*, head R has descended of its own weight in front of wheel D, ready for the assembling of another line, which can be in process during the described operation of arm T in moving the previously-assembled line up the type-channel A to its final justification, as shown in Fig. 1.

It will be seen that there is a well-defined element of method in my invention. In applying to the use of types whose thicknesses are based upon the multiples of a given unit the principle of keeping the words separated by temporary removable hollow false spaces until the number of units of type assembled nears the total number of units in a line, and then by proper methods ascertaining the number and thicknesses of space-types necessary to fill out and justify the line, and then in selecting and inserting in the temporary removable hollow false spaces the ascertained true or correct permanent space-types, and then withdrawing the temporary hollow false spaces, thus leaving between the words the true or permanent space-types required to justify the line, there are methods and processes involved which are important and valuable features of my invention.

It should also be understood that the use and value of my removable hollow space is not dependent on the mechanism which I have shown and described as a form, and a desirable form, of mechanism for inserting and removing the hollow space, for this hollow space

can be inserted and removed by the hand of the attendant or by the aid of simple tools therefor.

What I claim, and desire to secure by Letters Patent, is—

1. A non-crushable removable hollow false space adapted to be temporarily placed between the words, in the process of assembling and justifying type, having a continuous aperture through it adapted to permit the passage of the true or permanent space-type into and through the false space.

2. A non-crushable removable hollow false space adapted to be temporarily placed between words, in the process of setting and justifying type, comprising side walls adapted to bear against abutting types and to permit of the inserting of a true space-type between them, the hollow space being for the purpose of keeping the words separated until the desired permanent space-type can be inserted.

3. In type-justifying devices, a hollow false space comprising side plates at sufficient distance apart to admit of the passage of a space-type between them, said side plates being contracted or narrowed laterally in their lower portion and being secured together by edge plates above the contracted portions.

4. In type-justifying devices, a false space comprising a hollow body member and an ear or ears projecting laterally therefrom adapted for supporting the false space.

5. In a type-justifying device, a false space comprising a hollow body member, a laterally-projecting ear or ears and an outwardly-flaring top.

6. A removable hollow false space E, provided with ears F F, substantially as described.

7. In mechanism for the justification of type, the combination of a type-supporting device, a temporary non-crushable removable hollow false space adapted to receive a true space therein, and means for inserting the hollow false space between the words of types.

8. In mechanism for the justification of type, the combination of a type-supporting device, a removable hollow false space, means for inserting a true or permanent space-type in the hollow of the false space, and other means for withdrawing the false space.

9. In mechanism for justifying type, a hopper, into which the space-types necessary for the justification of a line of type are assembled, having an opening through which the space-types are pushed outwardly, said opening being covered by a plurality of flexible guards of unequal length which, by yielding to the pressure brought against each succeeding space-type, permit it to be pushed out of the hopper while retaining within the hopper all the other space-types.

10. In mechanism for justifying type, the combination, with a type-supporting device, of a hollow false space movable with abutting type in and along the type-supporting device,

a hopper or reservoir holding a supply of space-types, and mechanism set in operation by the false space to discharge a true space-type into itself.

11. In a mechanism for justifying type, the combination of a type-supporting device, a removable hollow false space, means for inserting the hollow false space between the words of types, other means for inserting a true or permanent space-type in the hollow of the false space and still other means for withdrawing the false space.

12. The combination with a space-type hopper having a type-discharging aperture, of elastic guards in front of the aperture, a pusher adapted to force a space-type past the guards, an oscillating shaft having an arm contacting a pin on the pusher and another arm in the path of a movable actuating device.

13. The combination with a space-type hopper having a type-discharging aperture, of elastic guards of unequal length, an adjustable plate on the hopper to which the guards are secured and from which they project over the aperture, a reciprocable pusher to force the space-types past the guards, an oscillating shaft, an arm on the shaft contacting a pin on the pusher, another arm on the shaft projecting into the path of an ear on a type in a movable type-column, and a spring for retrieving the pusher.

14. The combination with a type-channel, of a revolving wheel at the head of the channel adapted to receive and force the types into the channel in upright position, a head R adapted to bear temporarily and removably against the front of the line of types, and a traveling slug K arranged to be at and secure the front of the line of types when the head is withdrawn.

15. The combination with a type-channel, a means for putting the type upright in the channel and forcing them along therein, of a head R bearing against and movable in front of the line of types adapted to hold them upright therein, a slug adapted to bear against the front end of the line of types when the head is removed, and a head V adapted when the unjustified line is completed to come behind the line of types and push it along.

16. The combination with a type-channel, of a type-shifting arm T mounted on a way reciprocatingly and tiltably alongside of and movable parallel with the type-channel, the way on which the reciprocating arm is mounted and an endless belt to which the arm is flexibly secured and by the movement of which it is caused to reciprocate and to tilt.

17. The combination with a type-supporting device, of a reciprocating arm having a head adapted to move an assembled line of movable types along a type-supporting device, means for reciprocally moving the arm, and a reciprocally-moving header R held yieldingly by counter-pressure against the

forward end of the assembled line of movable types for the purpose of holding the line erect and compact.

18. In mechanism for the justification of type, the combination of a removable hollow false space having laterally-projecting ears, an endless belt having fingers or projections which catch the ears of the hollow false spaces and elevate them, and guideways disposed to receive the ears of the false spaces upon which the false spaces are discharged and assembled for repeated use.

19. The combination with a type-supporting device, a removable hollow false space having a laterally-projecting ear, an elevating-belt provided with fingers to catch the false spaces, a sheer to push the ears of the false spaces off the belt-fingers, and an inclined guideway disposed to catch the ears of the false spaces.

20. The combination with a type-supporting device, of a removable hollow false space, an elevating-belt provided with fingers to catch the false space, a sheer to push the false space off the belt-finger, an inclined guideway for false spaces, a stop on the guideway, and a kicker to raise the false spaces over the stop.

21. In a type-justifying device, a type-sup-

porting channel comprising a bottom and two side walls beveled inwardly along their top lineal edges, in combination with a thereon-traveling hollow false space having flaring surfaces complementary to and bearing on the beveled edges of the type-supporting channel.

22. The combination with a type-channel and a laterally-extended table or galley at the extremity of the type-channel, of a laterally-movable slide to push the justified lines into the galley, an endless belt provided with a lug or flange, and a lever provided at one end with the pin movable in a slot in the slide and at the other end arranged to be moved by the lug on the belt.

23. The combination of type-channel A, removable hollow false spaces E E, wheel D, header R, reciprocating arm T, belt W, space-hopper B, elevating-belt D', guideways 6, stops 7, kicker 4, traveling slug K, slide H, all constructed and operating substantially as and for the purpose set forth.

In testimony whereof I affix my signature in presence of two witnesses.

CHARLES W. BOWRON.

Witnesses:

F. C. WALKER,
D. W. DUNHAM.