

March 17, 1936.

W. W. LASKER

2,034,104

PRINTING INTERPRETERS

Filed Oct. 12, 1932

16 Sheets-Sheet 1

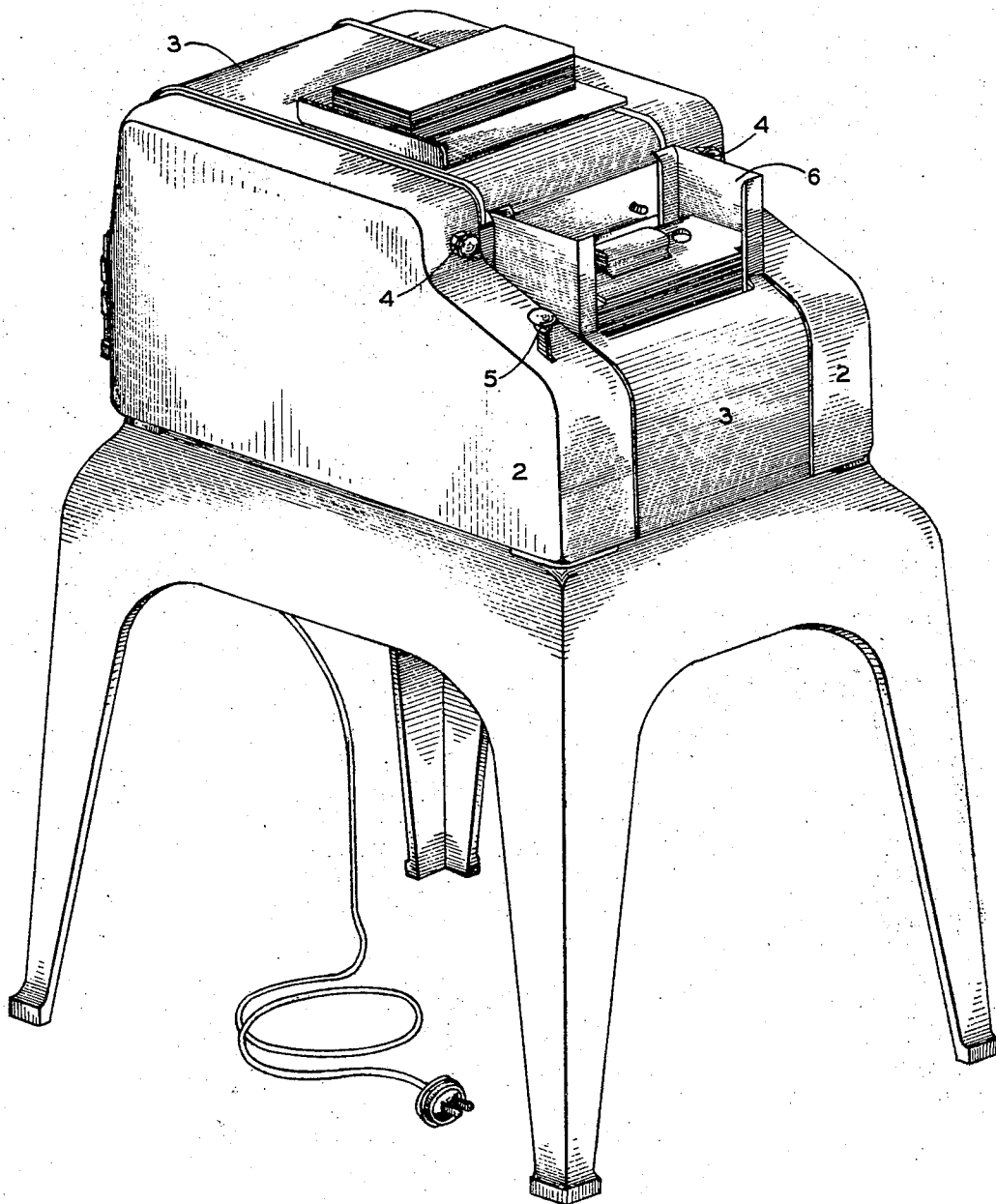


Fig. 1.

WITNESS

Wm. Rourke

INVENTOR

WILLIAM W. LASKER

by Charles H. Williams

ATTORNEY

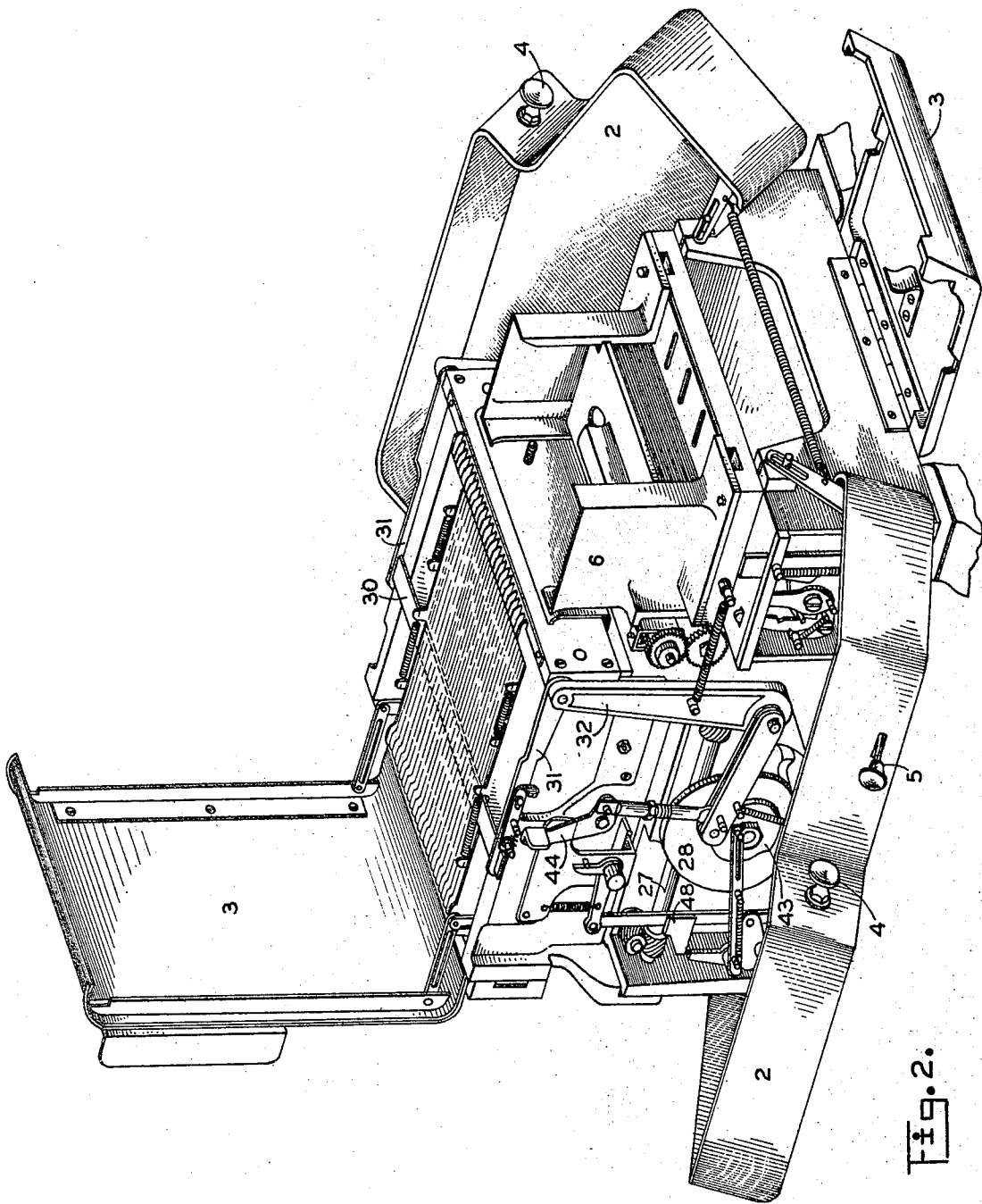
March 17, 1936.

W. W. LASKER
PRINTING INTERPRETERS

2,034,104

Filed Oct. 12, 1932

16 Sheets-Sheet 2



WITNESS

Wm. Rourke

INVENTOR
WILLIAM W. LASKER
by *Cedric H. Nelson*
ATTORNEY

March 17, 1936.

W. W. LASKER

2,034,104

PRINTING INTERPRETERS

Filed Oct. 12, 1932

16 Sheets-Sheet 3

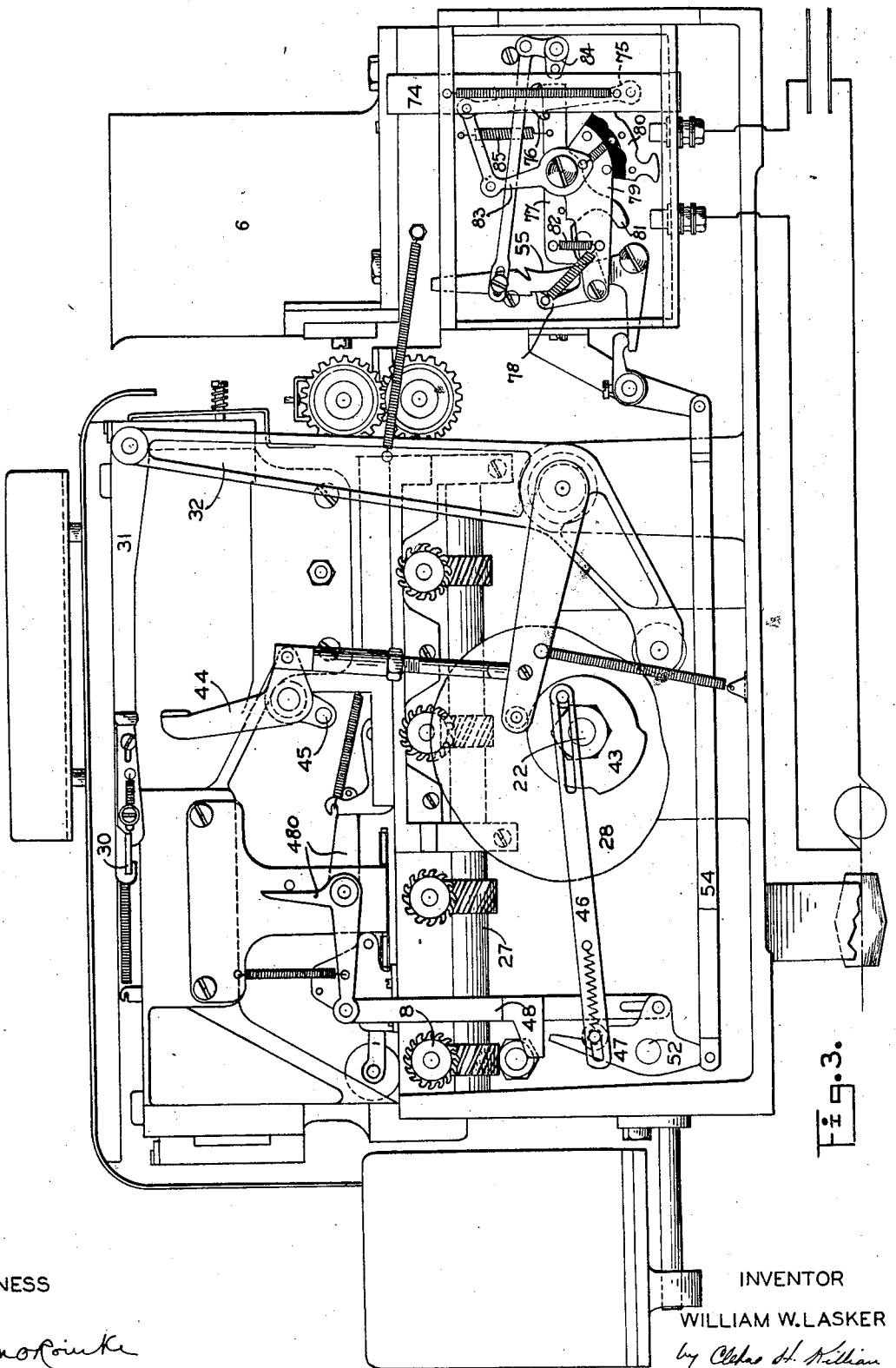


Fig. 3.

WITNESS

Wm. L. Lasker

INVENTOR

WILLIAM W. LASKER

by Charles H. Milham

ATTORNEY

March 17, 1936.

W. W. LASKER

2,034,104

PRINTING INTERPRETERS

Filed Oct. 12, 1932

16 Sheets-Sheet 4

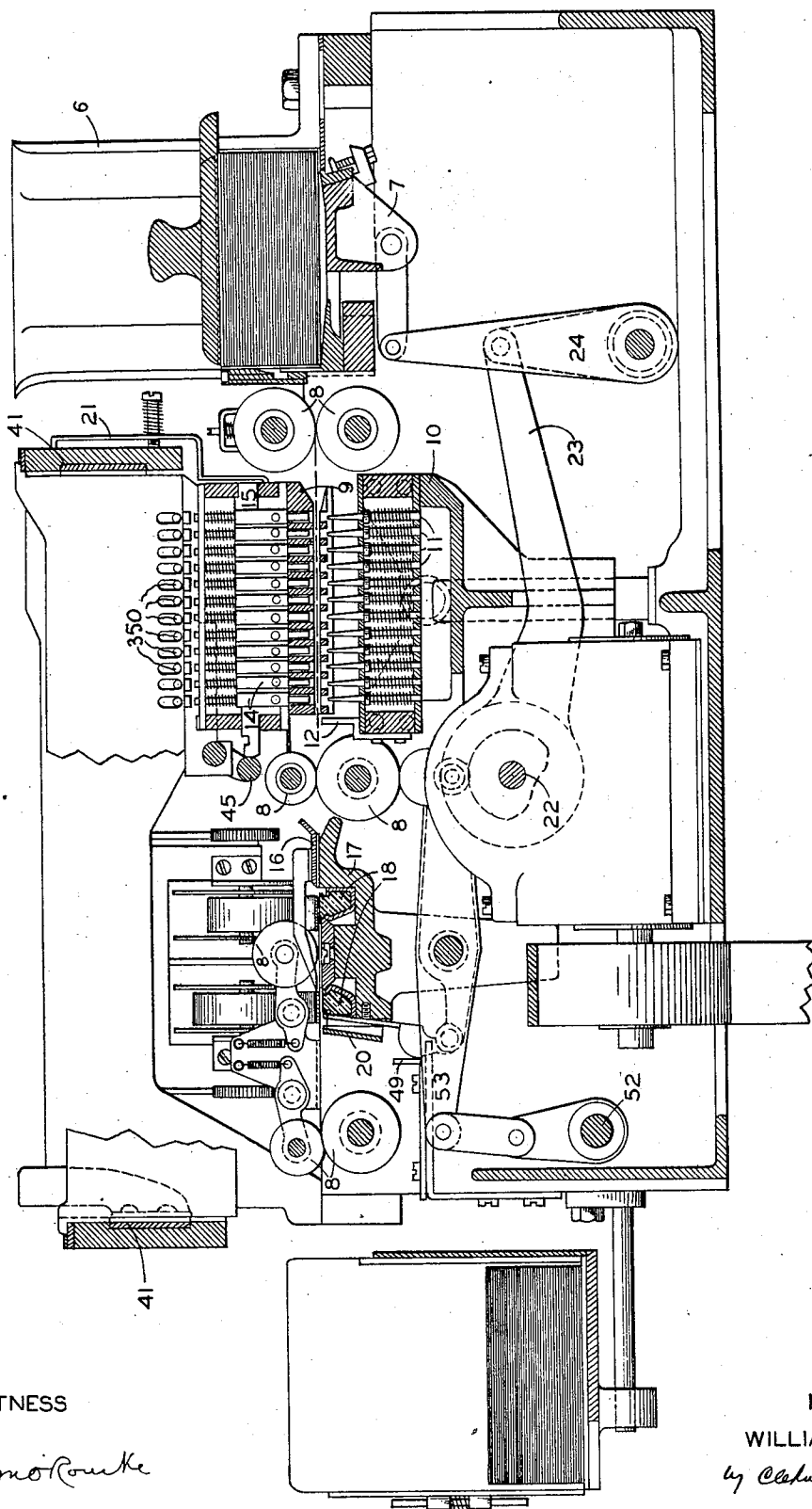


Fig. 4.

WITNESS

D. M. Rourke

INVENTOR

WILLIAM W. LASKER

by Charles H. Hillman

ATTORNEY

March 17, 1936.

W. W. LASKER

2,034,104

PRINTING INTERPRETERS

Filed Oct. 12, 1932

16 Sheets-Sheet 5

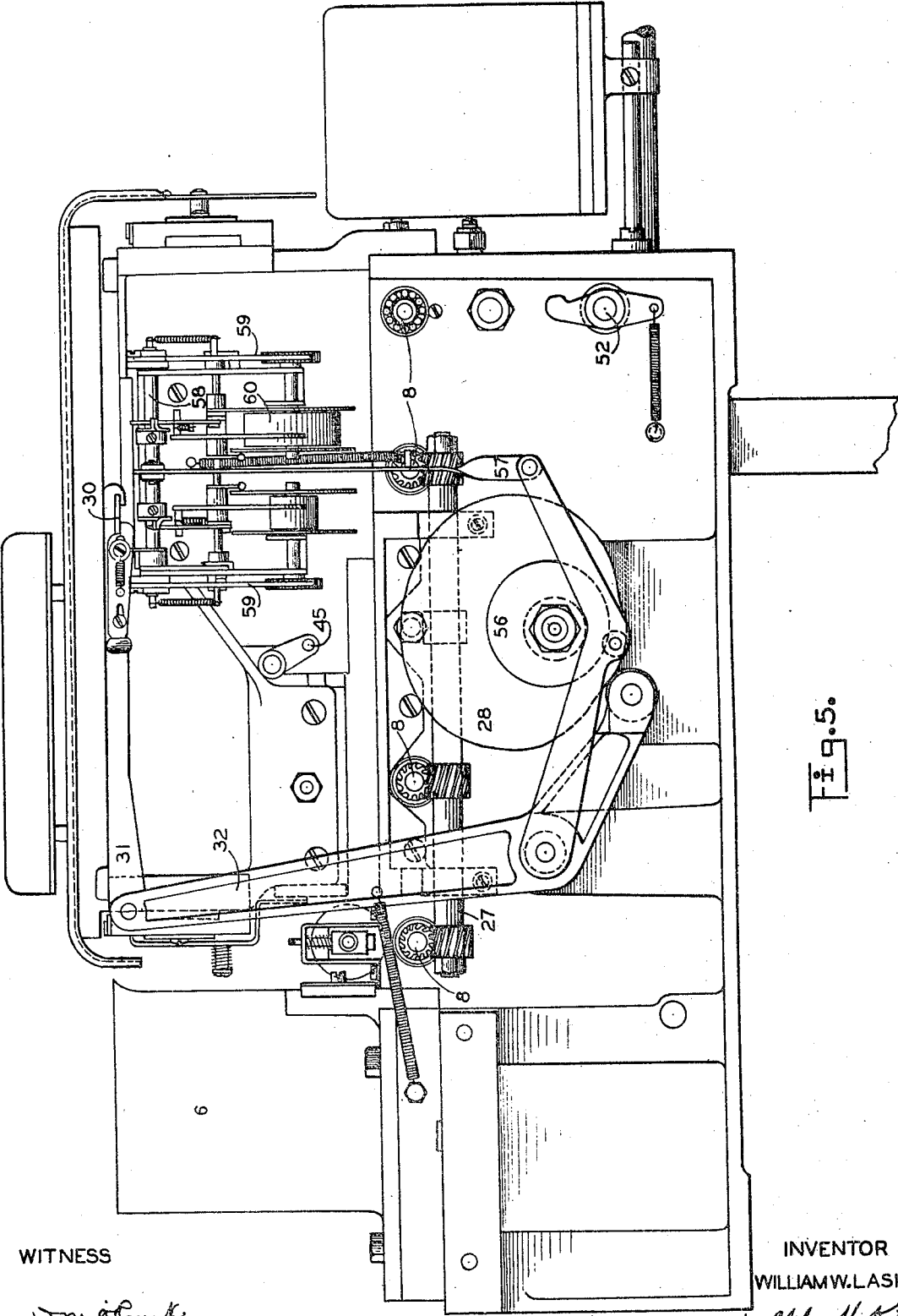


Fig. 5.

WITNESS

Wm. Rourke

INVENTOR
WILLIAM W. LASKER

by Charles H. Kellison
ATTORNEY

March 17, 1936.

W. W. LASKER

2,034,104

PRINTING INTERPRETERS

Filed Oct. 12, 1932

16 Sheets-Sheet 6

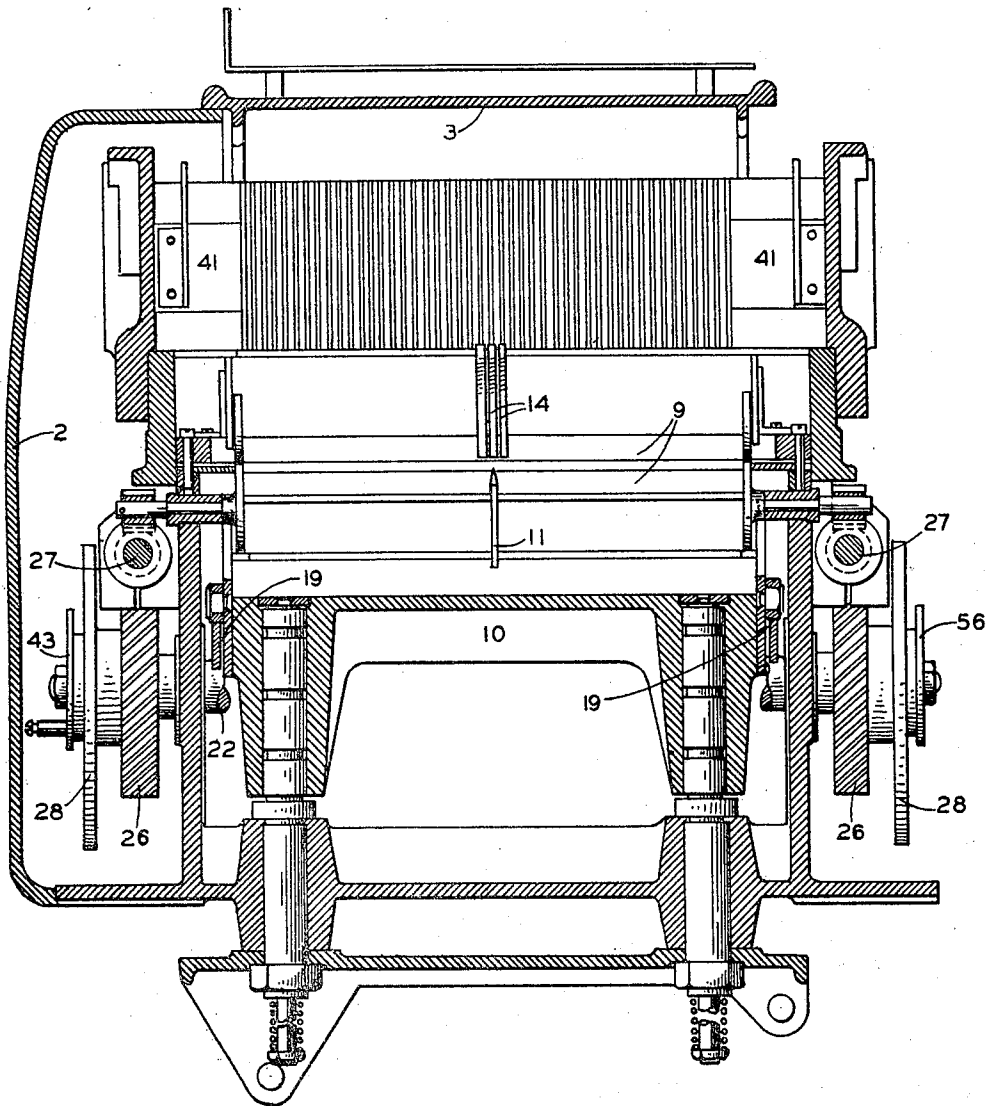


Fig. 6.

WITNESS

Wm. Rourke

INVENTOR

WILLIAM W. LASKER

by Charles H. Hillman

ATTORNEY

March 17, 1936.

W. W. LASKER

2,034,104

PRINTING INTERPRETERS

Filed Oct. 12, 1932

16 Sheets-Sheet 7

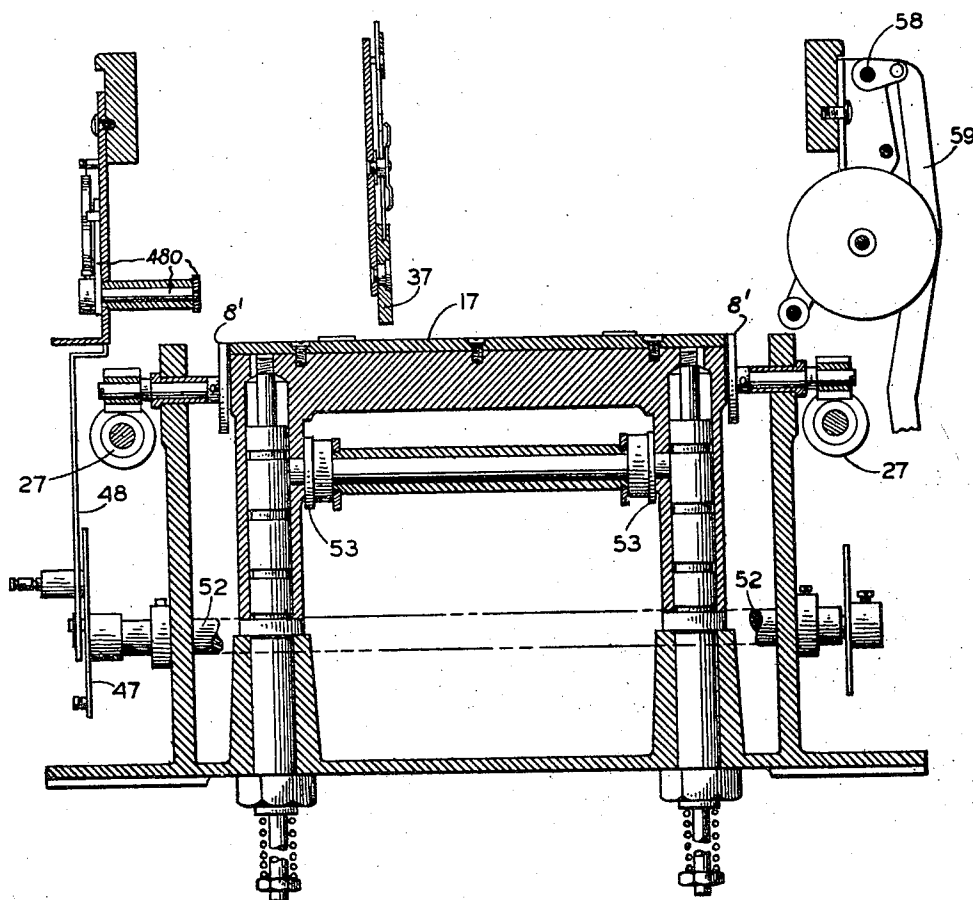


Fig. 7.

WITNESS

Wm. H. Lasker

INVENTOR

WILLIAM W. LASKER

by *Charles H. Kilham*

ATTORNEY

March 17, 1936.

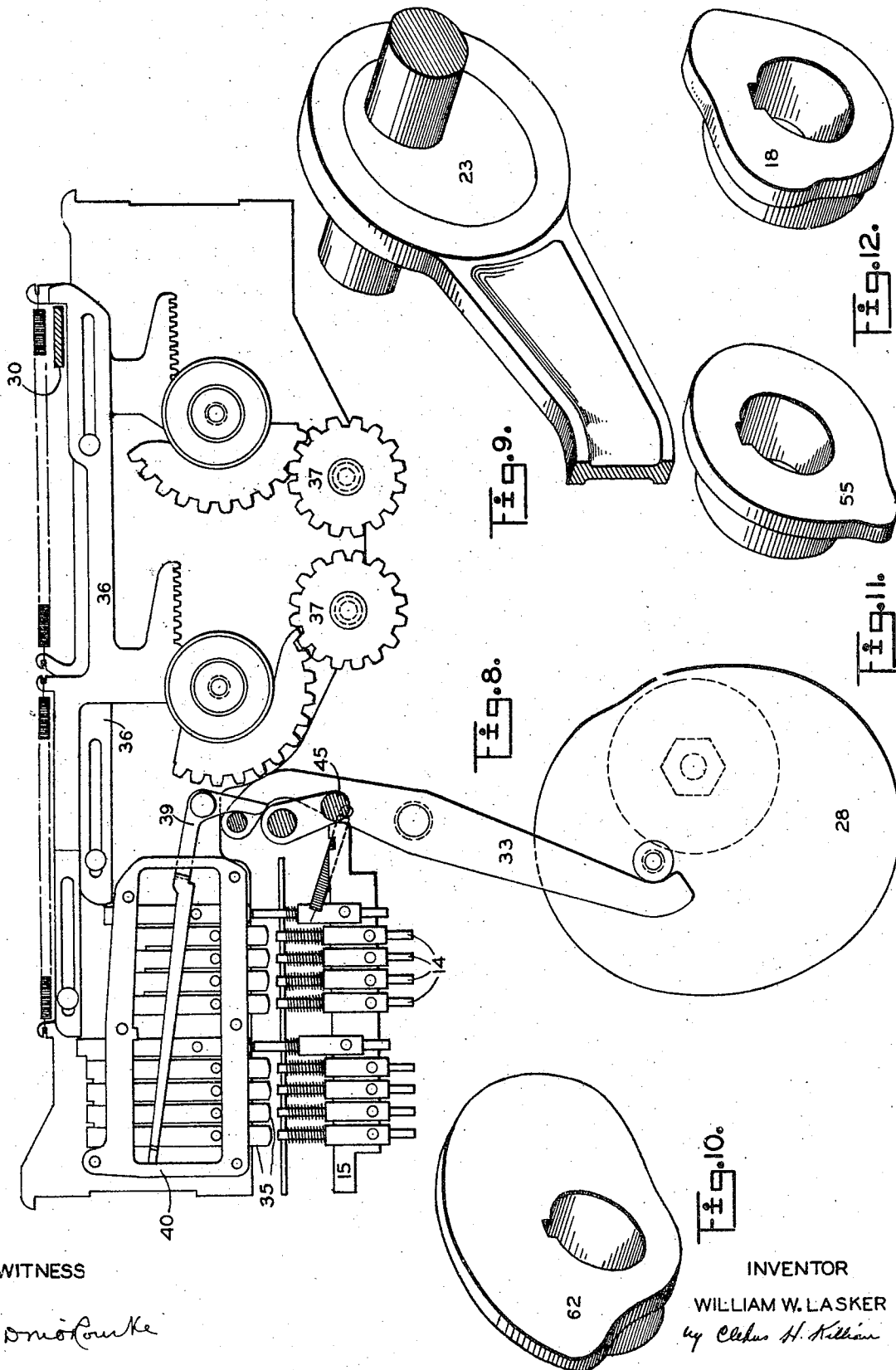
W. W. LASKER

2,034,104

PRINTING INTERPRETERS

Filed Oct. 12, 1932

16 Sheets-Sheet 8



WITNESS

Otto Runkle

INVENTOR

WILLIAM W. LASKER

by Charles H. Kellum

ATTORNEY

March 17, 1936.

W. W. LASKER

2,034,104

PRINTING INTERPRETERS

Filed Oct. 12, 1932

16 Sheets-Sheet 9

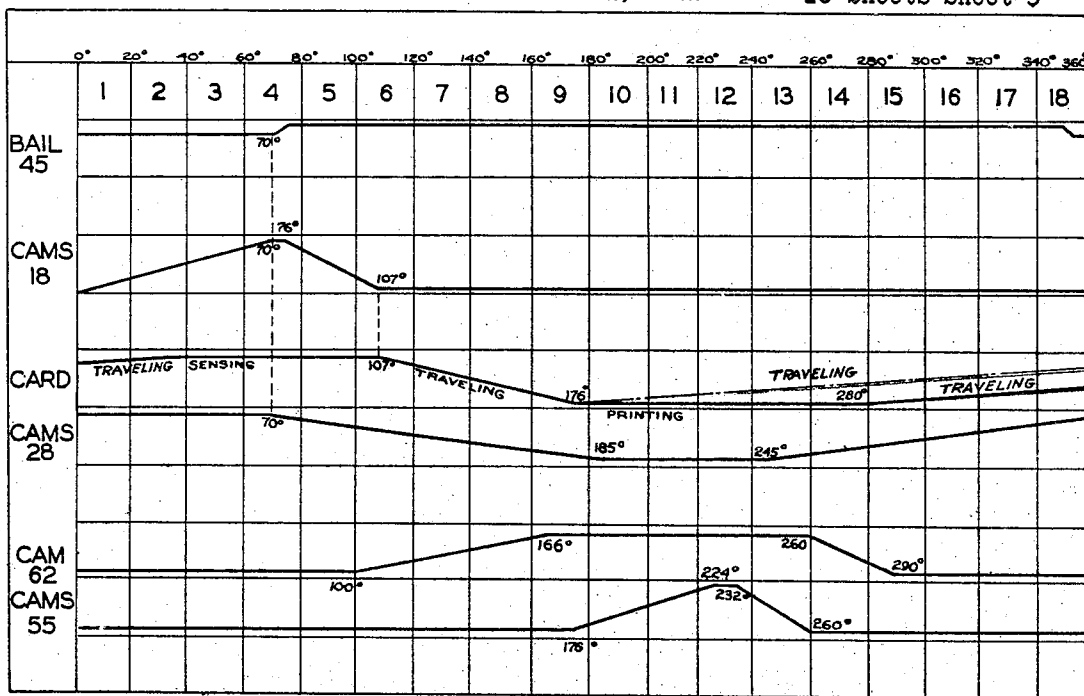


Fig. 13

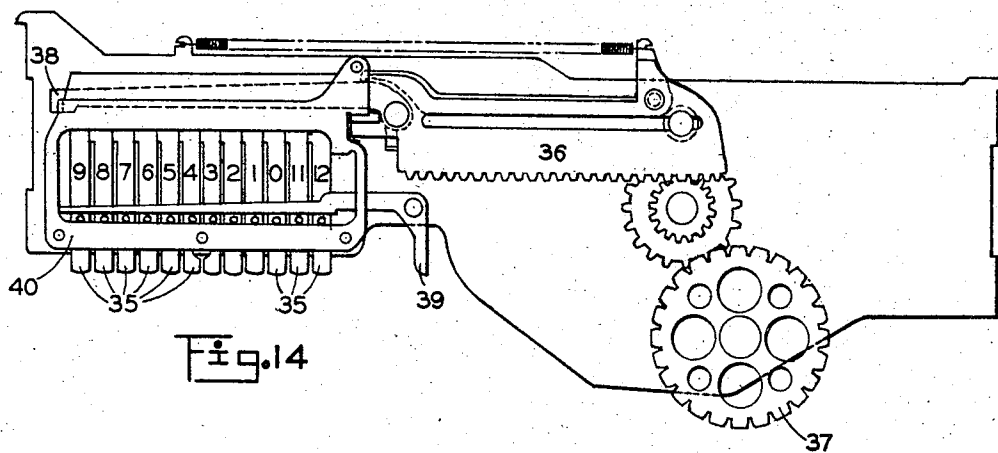


Fig. 14

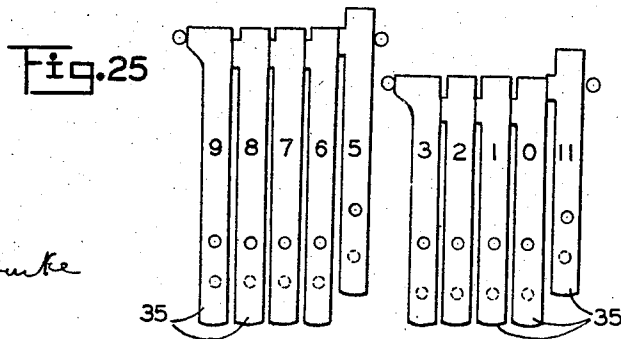


Fig. 25

WITNESS.

One of the

INVENTOR

WILLIAM W. LASKER

by *Charles H. Kellian*

ATTORNEY

March 17, 1936.

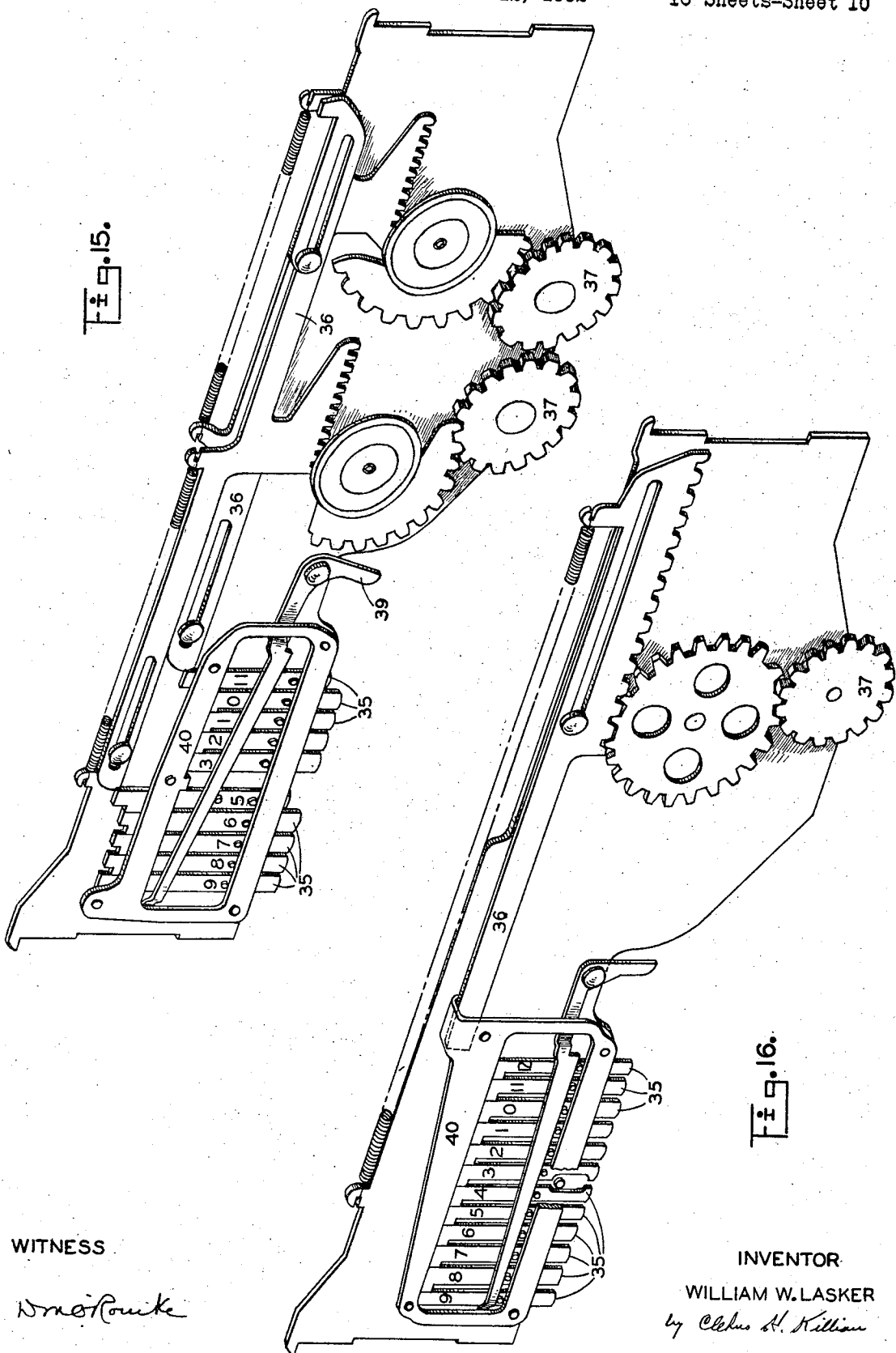
W. W. LASKER
PRINTING INTERPRETERS

2,034,104

Filed Oct. 12, 1932

16 Sheets-Sheet 10

Fig. 15.



WITNESS

Wm. Rourke

Fig. 16.

INVENTOR
WILLIAM W. LASKER
by *Charles H. Kilham*
ATTORNEY

March 17, 1936.

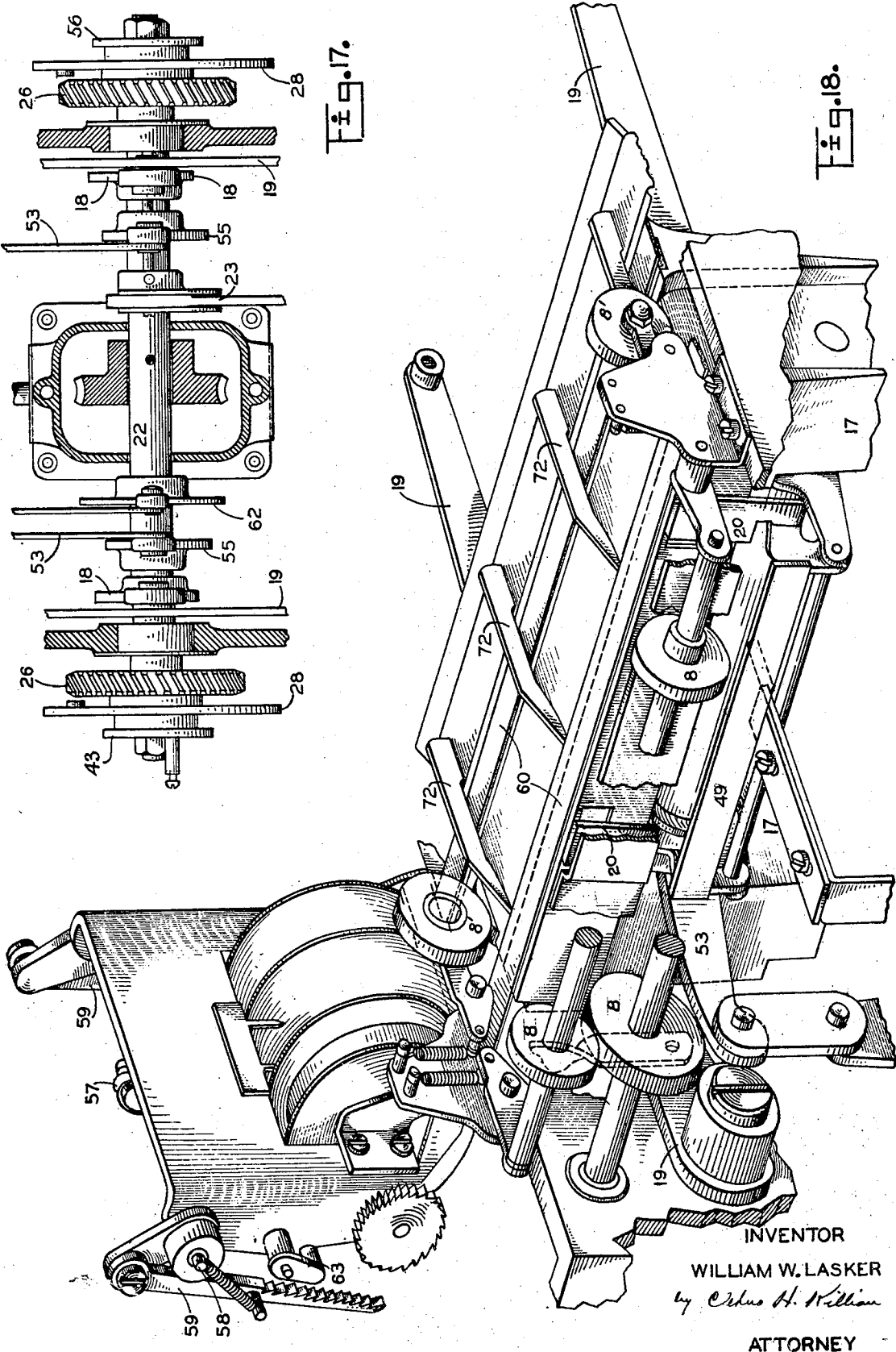
W. W. LASKER

2,034,104

PRINTING INTERPRETERS

Filed Oct. 12, 1932

16 Sheets-Sheet 11



INVENTOR

WILLIAM W. LASKER

by *Charles H. Williams*

ATTORNEY

March 17, 1936.

W. W. LASKER

2,034,104

PRINTING INTERPRETERS

Filed Oct. 12, 1932

16 Sheets-Sheet 12

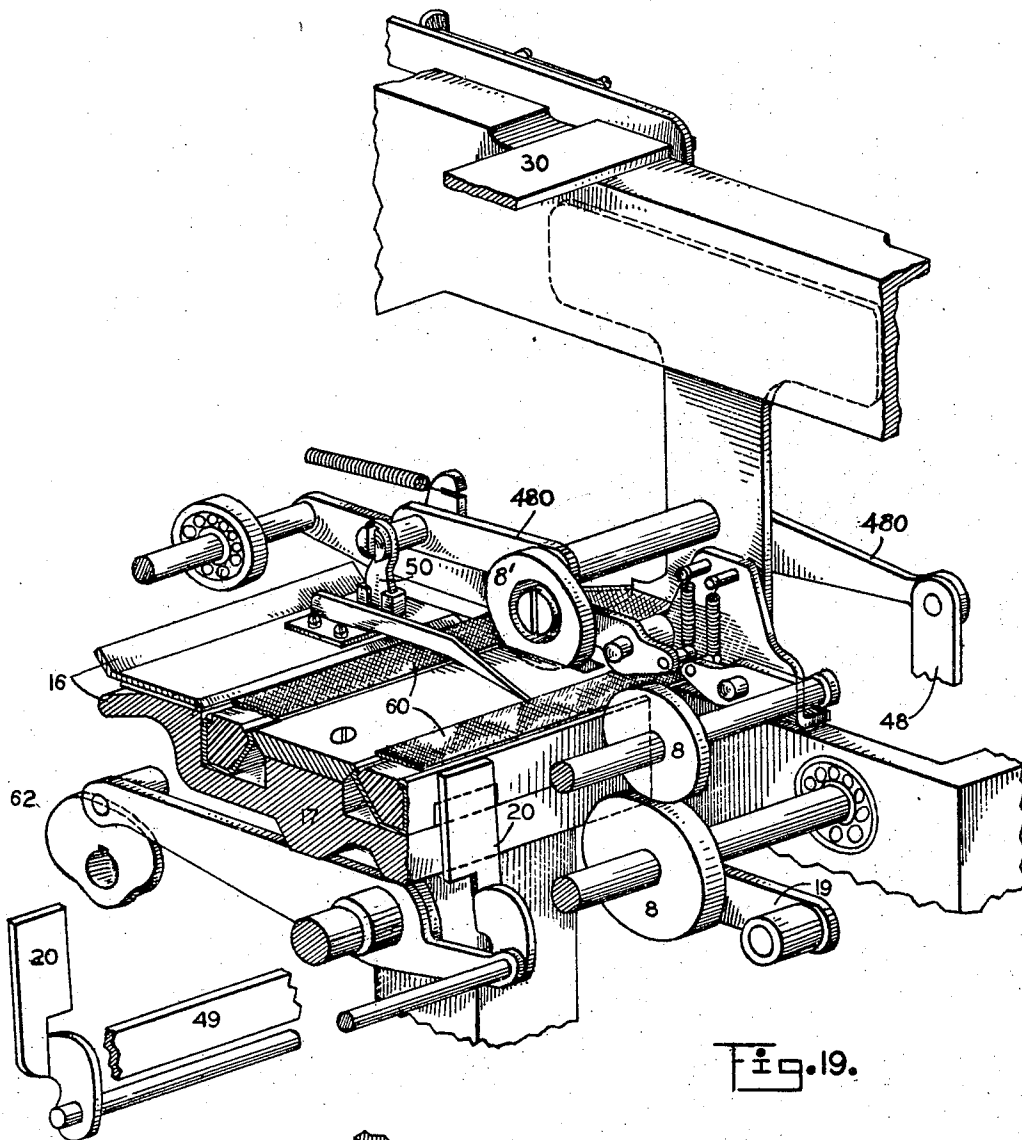
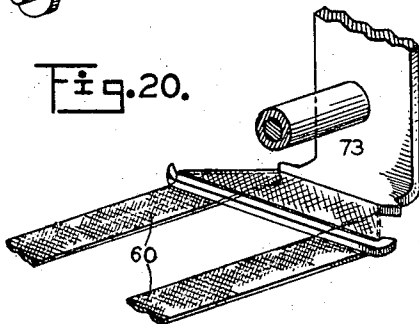


Fig. 19.

Fig. 20.



WITNESS

Smorucke

INVENTOR

WILLIAM W. LASKER

by Charles H. Williams

ATTORNEY

March 17, 1936.

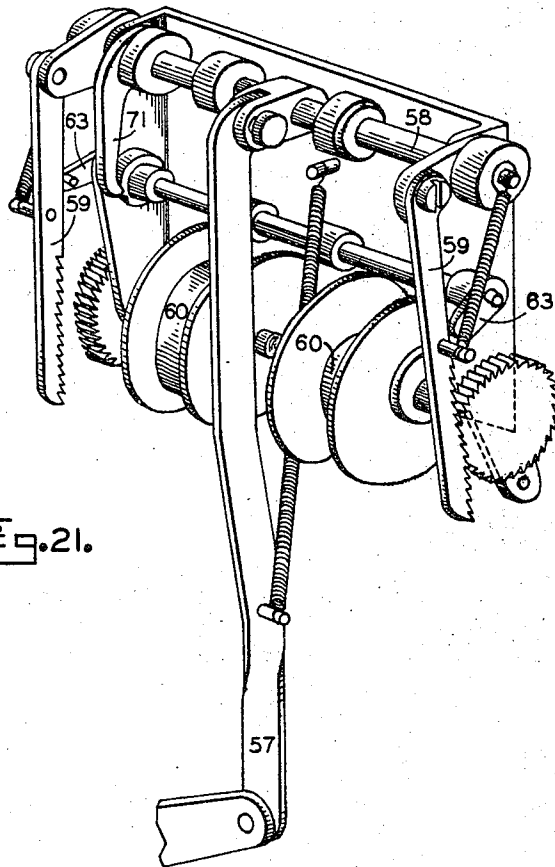
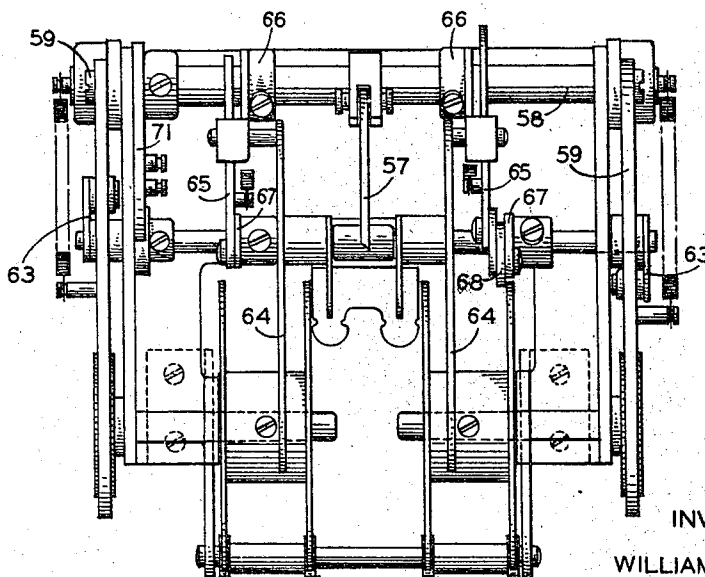
W. W. LASKER

2,034,104

PRINTING INTERPRETERS

Filed Oct. 12, 1932

16 Sheets-Sheet 13



WITNESS

INVENTOR

WILLIAM W. LASKER

by Charles H. Williams

ATTORNEY

March 17, 1936.

W. W. LASKER

2,034,104

PRINTING INTERPRETERS

Filed Oct. 12, 1932

16 Sheets-Sheet 14

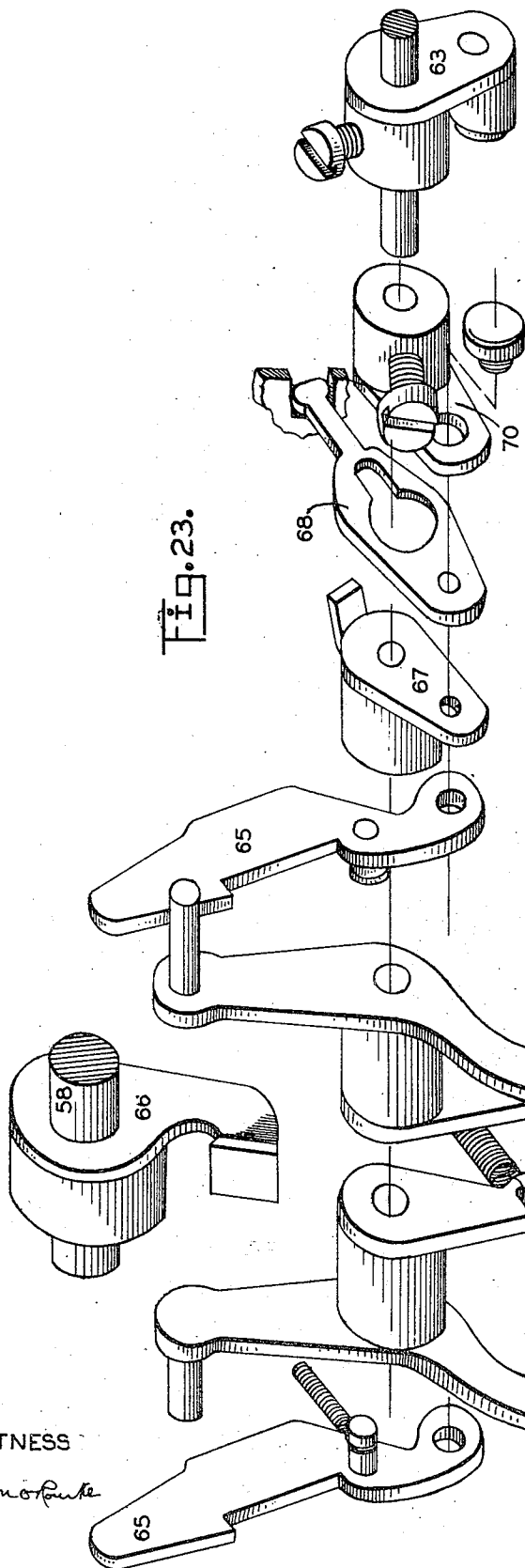


Fig. 23.

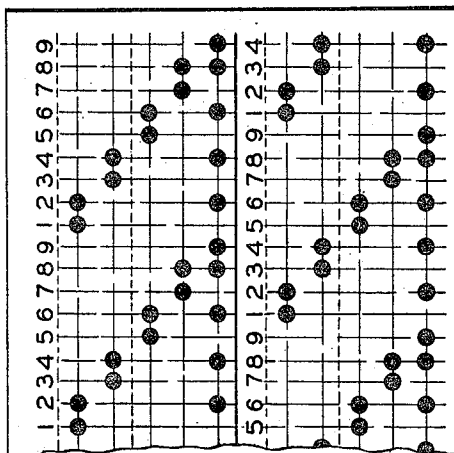
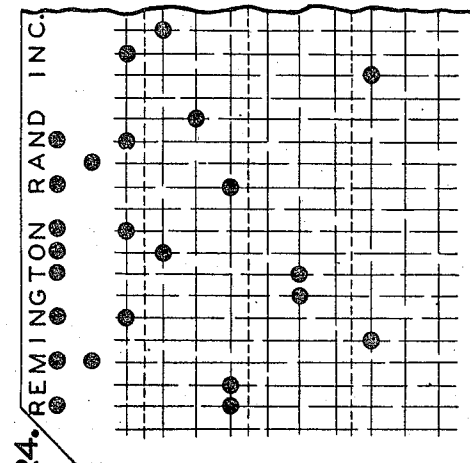


Fig. 24.

WITNESS

D. M. F. K. E.

INVENTOR

WILLIAM W. LASKER

by *Charles H. Kilham*

ATTORNEY

March 17, 1936.

W. W. LASKER
PRINTING INTERPRETERS

2,034,104

Filed Oct. 12, 1932

16 Sheets-Sheet 15

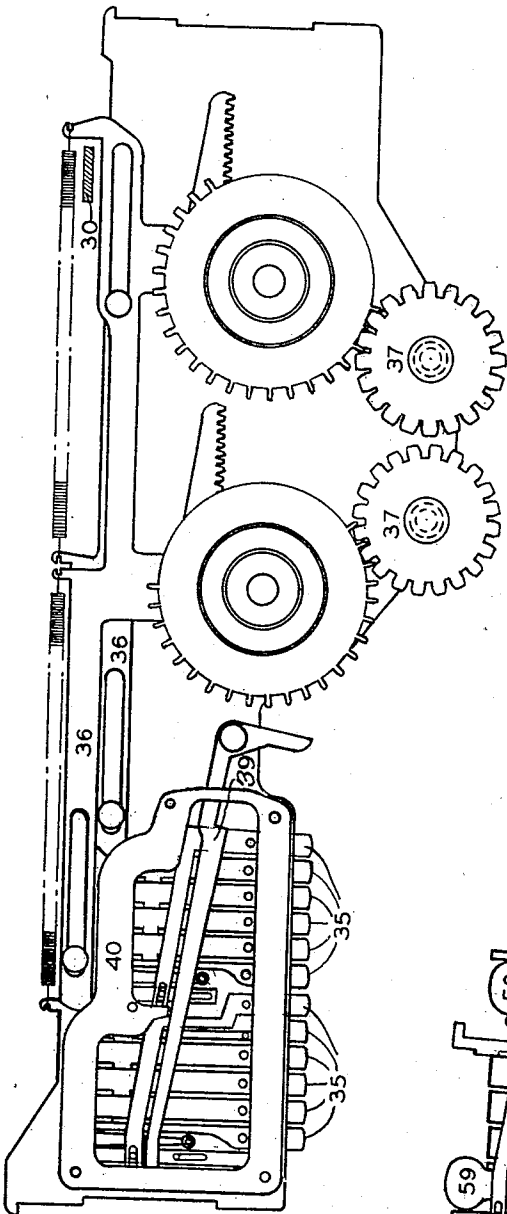


Fig. 26.

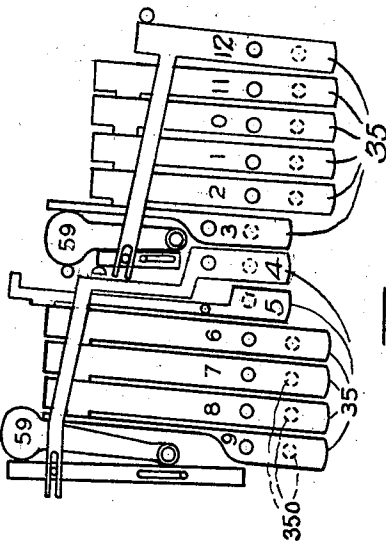


Fig. 27.



Fig. 28.

WITNESS

Dr. J. H. K. K.

INVENTOR
WILLIAM W. LASKER
by *Charles H. Killion*
ATTORNEY

March 17, 1936.

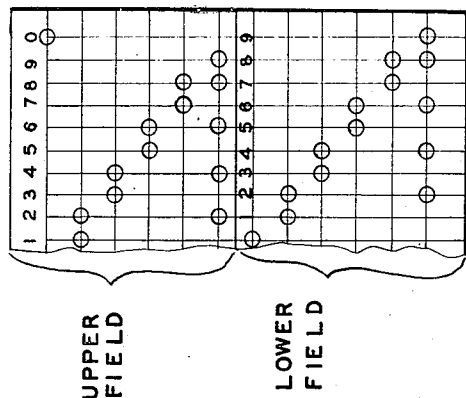
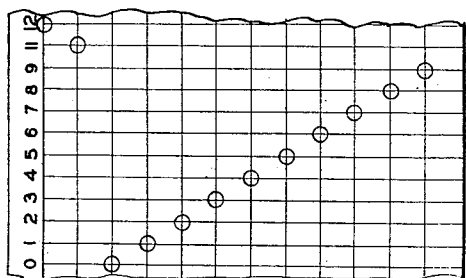
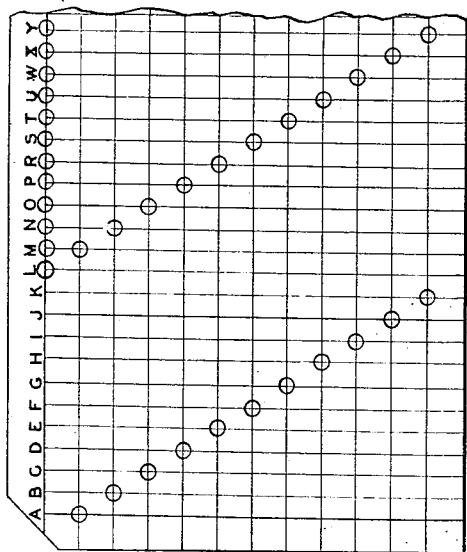
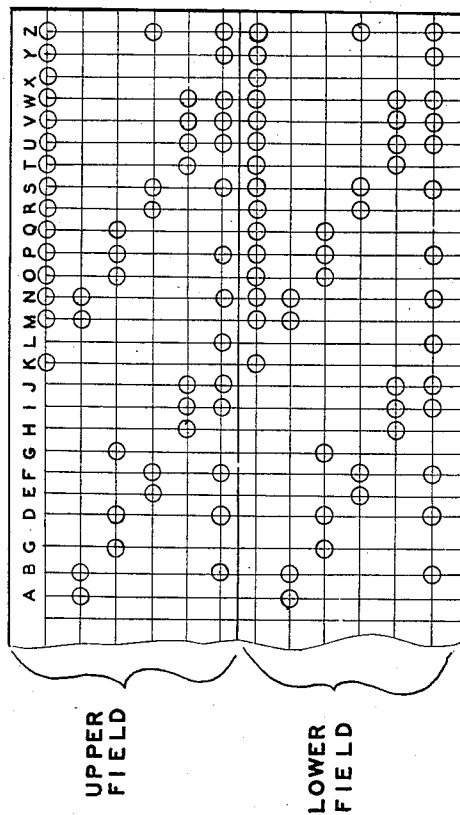
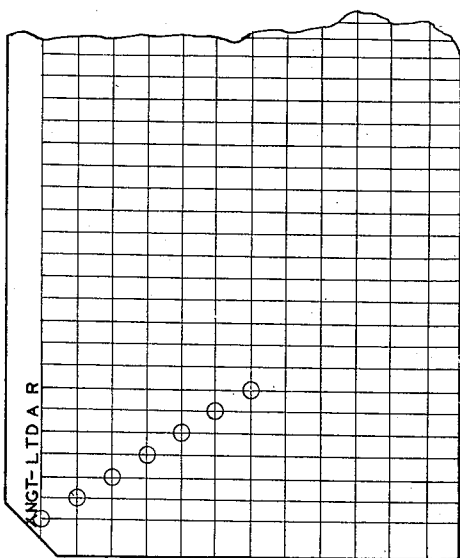
W. W. LASKER

2,034,104

PRINTING INTERPRETERS

Filed Oct. 12, 1932

16 Sheets-Sheet 16



INVENTOR
William W. Lasker.
by
Harris D. Hine, Jr.
ATTORNEY

UNITED STATES PATENT OFFICE

2,034,104

PRINTING INTERPRETERS

William W. Lasker, Brooklyn, N. Y., assignor to
Remington Rand Inc., Buffalo, N. Y., a corpora-
tion of Delaware

Application October 12, 1932, Serial No 637,401

13 Claims. (Cl. 101—93)

One object of my invention is to devise a machine which will print an interpretation of the perforations in a tabulating machine card, directly upon said card.

Another object of my invention is to print interpretation of the perforations in a tabulating card irrespective of the system or code by which the perforations were generated.

Another object of my invention is to print the interpretations on a tabulating machine card which has been perforated according to variable codes.

Another object of my invention is to print interpretations of perforations representing alphabetic characters.

Another object of my invention is to print an interpretation of perforations in either a numerical or an alphabetic code irrespective of the system which generated the perforations.

Another object of my invention is to provide means for printing an interpretation of perforations in any field of the card and to adapt the machine to print the interpretations and perforations in the same field when perforated according to a different code.

Another object of my invention is to simplify the main driving mechanism of card controlled machines.

Another object of my invention is to provide means for disabling the printing mechanism when a card is absent.

Another object of my invention is to stop the machine when there is no card in either the magazine, the sensing chamber, or the printing chamber.

Another object of my invention is to provide a new and improved ink ribbon feeding and reverse mechanism. Other and subsidiary objections will appear as the specification proceeds.

Fig. 1 is a diagrammatic isometric view of the entire machine.

Fig. 2 is a diagrammatic isometric view of the machine with the covers open so as to expose the working parts of the machine.

Fig. 3 is an elevation of the switch side of the machine.

Fig. 4 is a typical section of the machine showing the card picking mechanism, the sensing mechanism and the printing mechanism.

Fig. 5 is an elevation of the ribbon reverse switch side of the machine.

Fig. 6 is a section of the machine through the sensing mechanism.

Fig. 7 is a section of the machine through the printing mechanism.

Fig. 8 is a view of an element for interpreting upper and lower 90-column perforations.

Fig. 9 is an isometric view of the card picker eccentric.

Fig. 10 is an isometric view of the card stop cam.

Fig. 11 is an isometric view of the printing cam.

Fig. 12 is an isometric view of the sensing box cam.

Fig. 13 is a diagram of the cam timing of the machine.

Fig. 14 is a side view of an alphabet interpreting printing element.

Fig. 15 is an isometric view of upper and lower 90-column numerical interpreting element.

Fig. 16 is an isometric view of a 45-column numerical interpreting element.

Fig. 17 is a top plan view of the main shaft and its cams.

Fig. 18 is an isometric view of the printing platen and a portion of the ribbon mechanism.

Fig. 19 is a fragmentary view similar to Fig. 18.

Fig. 20 is an isometric view of the ribbon cross-over.

Fig. 21 is an isometric view of the ribbon reverse assembly.

Fig. 22 is an elevation of mechanism of view 19.

Fig. 23 is an exploded isometric view of elements constituting a portion of the ribbon reverse mechanism.

Fig. 24 is a diagram of a fragment of a card illustrating different perforations and their printed interpretations.

Fig. 25 is a plan view of the stops used with the combination perforations for 90-column codes.

Fig. 26 is a side view of an element for interpreting a "three hole" alphabetic combination code.

Fig. 27 is a diagram of the stops used in Fig. 26.

Fig. 28 is a developed view of the various printing wheels of the interpreting elements.

Fig. 29 is a view of a card, perforated according to the straight, or 45 column, code, showing the perforations and the corresponding interpreter printing thereon.

Fig. 30 is a view of a card, perforated according to the 45 column alphabetic code, showing the perforations therein indicative of the several items and the interpreter printing thereon.

Fig. 31 is a view of a card, perforated according to the combination for 90 column code, and the corresponding interpreter printing thereon.

Fig. 32 is a view of a card containing control perforations and the interpreter printing corresponding thereto.

Fig. 33 is a view of a card, perforated according

to the alphabetic three-hole code and the interpreter printing corresponding thereto.

Referring to Fig. 1 it is seen that the machine is supported by a suitable leg base frame 1, the upper portion of which supports an electric driving motor indicated by the presence of a connecting electric cord and plug. The working parts of the machine are enclosed by a pair of swinging covers 2, and lids 3. Fig. 2 shows the covers 2 and the lids 3 swung outwardly so as to expose the working parts of the machine. Suitable bosses are provided for limiting the inward movement of the lids 3, and each of the covers 2 are provided with a usual form of spring catch 4 which cooperates with holes in the main frame of the machine to retain the covers in the position shown in Fig. 1. One of the covers is provided with a spring-pressed lever 5 for either starting or stopping the machine. The operation of the covers 2 may be likened to that of an ordinary Boston bag or pocket-book. Located on the lid 3 is the usual angle plate for justifying the cards prior to placing them in the magazine 6.

The frame of the machine is a usual form of skeletonized box comprising a base or bottom, sides, and ends which support the various studs, bearings for shafts, anchorages for springs, etc. Fixed to the base is a housing for the worm drive and guiding studs or parts, for the reciprocating pin box assembly, and for the reciprocating printing platen. Hereinafter it will be tacitly assumed that all removable elements are supported by the framework, that sub-frames are supported thereby, that all springs have one end anchored to the framework, etc., according to common machine constructional practice, unless the contrary is specifically mentioned.

General operation of the machine

The cards to be interpreted are stacked and weighted in the magazine 6 (Fig. 4) and are fed successively from the bottom of the stack by a power reciprocated picker 7; thence through a usual form of adjustable throat opening; thence to the first of a series of pairs of continuously rotating feed rolls 8; thence into the sensing chamber 9 which consists of a pair of matched perforated plates having their perforations at positions corresponding to every possible perforation in a card. The lower matched plate of the sensing chamber 9 lies slightly above the sensing pins of the reciprocatory sensing box 10 when said box is in its lowest position; said box also carries the card stop 12. Located at the extreme ends of the sensing chamber 9 is a pair of skid rolls 8' (Fig. 6) for feeding a card after it has left the first pair of feed rolls 8. The sensing box 10 (Fig. 4), rises so that the card stop 12 is in a path of the card before it has reached the position for sensing, but the pins of the pin box do not pass the top plane of the lower matched plate until after the card has reached the card stop 12 and universal bar 30 has reached its rearmost position (to the left as viewed in Fig. 3, or to the right as viewed in Fig. 8). Continued upward movement of the sensing box causes certain of the sensing pins 11 to find the perforations in the card, and further upward movement causes the pins 11 which have found perforations to elevate the corresponding spring-pressed intermediate pins 14 which, in turn, are latched by spring pressed slides 15 in their elevated positions at about the time the sensing box 10 has reached its extreme upward position; thus the perforations in the card are finally represented by latched intermedi-

ate pins 14 before the sensing box 10 has begun its descent. When certain of said pins have become latched up, bar 30 travels forwardly (to the left as viewed in Fig. 8) allowing spring-pulled measuring bars 36 (Figs. 5, 8, 14, 15, 16 and 26) to follow until they engage the elevated stops 35 to position the type wheels 37. All latches 15 are shifted simultaneously, therefore, a universal spring urged bail or formed plate 21 (Fig. 4) may replace the usual individual springs for each latching slide. Adjusting screws are used to regulate the tension of plate 21. The box 10 descends to remove the card stop 12 and this permits the skid rolls 8' to feed the card into the second pair of feed rolls 8; thence into the printing chamber 16. The printing chamber 16 consists of an upper plate with an opening for type wheels and the lower part consists of a substantial casting 17 in which are embodied resilient printing pads 18. Also mounted at the extreme sides of the printing chamber is a pair of skid rolls 8' similar to those used in the sensing box for feeding the card against the pre-positioned card stops 20 and also out of the printing chamber, when the said card stops are withdrawn, thence to the last pair of feed rolls 8 which eject the printed interpreted card into a suitably located storage magazine.

The driving of the pairs of feed rolls 8, the reciprocations of the picker 7; of the sensing box 10; of the platen 17; of the card stops 12 and 20 and the operation of the ink ribbon mechanism are controlled from the main shaft 22. The main shaft 22 is driven from a suitably located electric motor (indicated by a conventional diagram, Fig. 3) through a belt, worm and worm wheel, the latter of which is attached near the center of the main shaft 22 as is best shown in Fig. 17.

Adjacent the housing of the worm drive is attached the picker eccentric 23 (see also Figs. 9 and 17) which causes the picker 7 to be reciprocated through the medium of a link surrounding said eccentric and a motion multiplying shaft and arm mechanism 24 (Fig. 4) which is directly connected by a short link to the picker 7. Hence, the picker 7 makes a complete reciprocation for each rotation of the main shaft 22. Adjacent the worm drive housing is a cam 62 (see also Fig. 17) for governing the card stop for the printing mechanism. Said cam is adapted to oscillate an arm fixed to a sleeve pivoted on an intermediate shaft. Two arms fixed to said sleeve extend rearwardly to support a bail on which is pivoted a pair of symmetrically arranged spring urged card stops 20 (see Figs. 7 and 18 and 19) which are projected and withdrawn at the proper times from the path of the card as it travels through the printing chamber.

The card stops 20 of the printing mechanism are resiliently urged rearwardly by spring plungers contained in the massive part of the printing platen block 17 so that they will normally take a position corresponding to an extreme rearward one, which corresponds to the lowest possible print position on the card. As shown in Figs. 4, 18 and 19 each card stop 20 is provided with an extended heel near its pivot point. The card stops 20 can therefore be shoved against their springs by an adjustable universal ball 49 to regulate or determine the position on the card in the printing chamber which will receive the imprint. The rearwardly extending stem of the ball 49 is provided with slotted openings through which pass clamping screws for adjusting the said bail. This adjustment is desirable for locating the printing of the interpretation on a

part of the card where there are no perforations. However, the majority of cards have no perforations along the 12 row or along the 12 and 4 rows, hence neatness of the interpreted card suggests a lowering of the printing line, therefore the described adjusting mechanism is included.

Near the ends of the main shaft 22 is a pair of gears 26, each of which drives a shaft 27, one on each side of the machine (see Figs. 3, 5, 6, and 17). Fixed to each shaft 27 is a series of gears for driving the lower of the pairs of feed rolls 8. The first of the pairs of feed rolls 8 are positively geared together as shown in Fig. 3, but the upper rolls are usually driven by frictional engagement with the lower rolls or through the card as is shown in Fig. 18. Each shaft 27 drives the lower of the pair of skid rolls 8' in the sensing chamber and the pair of skid rolls 8' in the printing chamber in exactly the same manner as the lower of the pairs of rolls 8. The upper skid rolls 8' are frictionally driven as above described. In each case the frictionally driven rolls are mounted on spring urged frames, or levers as the case may be, as is the usual practice in perforated card controlled mechanisms.

Adjacent each gear 26 is a lobe shaped cam 28. Said cam 28 drives the reciprocating universal bar 30 (Figs. 3, 5, and 17) through a pair of links 31 which in turn are pivoted at the upper end of the frame supported bell cranks 32, whose lower ends carry rollers riding on the peripheries of said cams 28. For the purpose of facilitating the change of interpreter slides, each link 31 is provided with a simple form of spring-pressed latch fitting into grooves on the universal bar 30 so that a manipulation similar to that of opening a cabinet door is sufficient to release the main restoring bar 30. This construction is desirable for, at times, it is necessary to remove, substitute, or replace one or more devices such as those illustrated in Figs. 8, 14 and 26, and the construction is such that the universal bar 30 lies beneath the actuating springs but over the measuring bars 36 of said members. Each cam 28 (see Figs. 8 and 17) carries a roller which rocks a frame-supported, spring-urged lever 33 for each rotation of the main shaft 22. The upper ends of said levers 33 are joined by a bar which is universal to the shorter arms of all of the bell cranks 39, hence rocking of levers 33 results in rocking bell cranks 39 and therefore, a positive lowering of all of the slidable stops 35. (Figs. 8, 14, 15 and 16.)

Fixed to the main shaft 22 is a pair of sensing box cams 18, (Figs. 12, 17) on which ride anti-friction rolls carried by a pair of long arms 19 (Figs. 18 and 19) pivoted near the rear of the machine on frame supported studs. The forward ends of said arms underlie studs fixed to the frame of the sensing box 10, (Fig. 6) hence said cams 18 rock said arms 19 to operate the sensing box during each rotation of the main shafts.

Adjacent the cams 18 is a pair of platen operating cams 55 (Figs. 4, 11, and 17) each rock a platen operating lever 53 to elevate the respective sides of the platen block 17. The levers 53 are pivoted to studs integral with the platen block 17 and their extreme rear ends are pivoted to the upper ends of a pair of toggle links 530, whose lower arms are fixed to the shaft 52. When there is no card in the printing chamber a record presence sensing mechanism causes said toggles to be broken so that the platen block 17, although

it started its upward excursion, is permitted to drop and remains in its lower-most position during an operation of the main shaft, if the said main shaft is kept in operation by holding lever 5 depressed.

The frame of the sensing box 10 and the platen block 17 are mounted on a pair of stout hollow posts (see Figs. 6 and 7) which are fixed to the base of the machine. These posts accurately guide these parts in their reciprocatory movements so as to prevent a tendency to rock sideways when sensing cards with a preponderance of perforations near one edge or when printing interpretations of alphabetic codes or 45-column numerals. Extending through the center of each hollow post is a rod fixed to the respective reciprocating frames. The lower end of each of said rods is surrounded by a spring, which in turn is held in place by a nut. These springs tend to hold the sensing box 10 and the platen block 17 in their lowermost positions, and thus hold arms 19 and 53 in engagement with their respective operating cams.

The card stop 12 is mounted on the sensing box 10. It, therefore, follows that the movements of the latter closely simulate that used for the pin box of the familiar Powers tabulator (see Powers Patent 1,245,502). The card stop 20 for the printing chamber is operated by a separate cam 62 shown in Figs. 10, 17, and 19. The cam 62 rocks its cooperating lever which is fixed to a sleeve surrounding the pivot shaft of the arms 53. The said sleeve carries an additional rearwardly extending arm to which is pivoted a slidable card stop 29 as well as the rearward extension of the arm cooperating with cam 62 as is clearly shown in Figs. 18 and 19.

Adjacent one of the cams 28 is a retractor cam 43 (see Figs. 2, 3, and 17) which, at times, operates a spring pressed lever (carried by the pivot of a bell crank 32); thence an adjustable link connected to a bell crank 44 attached to a frame supported retractor shaft, thence a retractor ball 45 which is universal to all the spring pressed slides 15. (See Fig. 4). Hence cam 43 is adapted to shift all of the locking slides 15, and, therefore, release all pins 14 which are elevated. The upper end of bell crank 44 is provided with a finger piece for manually releasing the pins 14 if the occasion so requires. A pin fixed to cam 43 (Fig. 3) extends through a slot in the link 45, which in turn is connected by a spring and pin-in-slot joint to a T shaped lever 47. If the platen 17 is traveling upwardly and a card is in the printing chamber 16, the card-presence sensing pin 50 (Fig. 19) will be elevated by said card, and through an offset lever 460 it will shift link 42 downwardly to block T shaped lever 47 against movement. If 47 is blocked the machine will continue to operate and the platen 17 will continue to rise to effect a printing operation. On the other hand if 47 rocks, then shaft 52, to which 47 is rigidly attached, will also be rocked and the toggle links (Fig. 4) between said shaft and the platen raising arms 53 will be broken and the platen 17 will not impinge against the printing types of the wheels 37. The lower arm of lever 47 is connected by a link 54 (Fig. 3) to a bell crank which in turn releases a latch 55 in the switch box to break the circuit of the driving motor. Thus simple mechanism is provided to break the motor circuit and disable the platen when the printing chamber is empty. This construction avoids fouling of the platen 17.

Adjacent the other cam 28 is a ribbon feed

cam 56 which operates a boomerang shaped lever (carried by the pivot of bell crank 32) whose forward end is connected by a link 57 (Figs. 5, 6, 17 and 21) to an arm fixed to the operating shaft 58 of the ribbon feed mechanism. Near each of the ends of the shaft 58 is a fixed arm, each of which carries a spring urged saw-toothed actuating rack 59 for the ribbon spool ratchets for feeding the inking ribbon 60. The ribbon reverse mechanism will be described under a separate heading.

Codes and their interpretation

For the purpose of explanation four usual types of "codes" will be briefly described.

Straight or 45-column code

As shown in Fig. 29, the straight or 45 column code utilizes one perforation in each column to indicate a single digit of the recorded number, perforations at the top of the card indicating the number "12", perforations at the second position indicating the number "11", perforations at the third position or level indicating a zero, perforations at the fourth level or position indicating the digit 1, and so on to the bottom of the card.

Alphabetic codes

As shown in Fig. 30, approximately the first half of the alphabet is indicated by single perforations, and approximately the second half by two perforations.

The type wheels for the upper and lower combination codes have any two of the characters K or X, or Y or W, for two positions thereon and hence all these characters are represented by the same perforation viz. 3 or 9. These characters are ones of comparatively infrequent occurrence and hence the context will clearly indicate the character intended. Indeed an arbitrary sign such as * may be used instead of any of these letters.

Combination or 90-column code

Fig. 31 shows the perforations according to the combination or 90 column code in which the customary card is divided into upper and lower fields. Half of each column of the older 45 column code system is utilized for all ten digits by means of a system of single and double perforations, the even numbered digits being indicated by two perforations.

Control perforation interpreting

Various column positions, not needed for recording, may be utilized for control perforations. Some examples of said control perforations are illustrated in Fig. 32.

In the foregoing tables, the locations of the code perforations in the card, which form the perforation code, are shown by the numbers in the vertical lines in the table; the vertical line representing a column across the card. A representation of all the digits in both upper and lower 90-column codes and certain words according to the foregoing codes are shown in Fig. 24.

The first or 45-column numeric code is transformed into a mechanical code by elevating a single stop at a position corresponding to the location of the perforations in the card. The familiar Powers sensing box has always been able to interpret this code. The specific means used in the present instance is best shown in Fig. 16, and consists of a series of slidable stops 35, any one of which may be elevated and temporarily

retained in the path of a spring urged measuring bar 36, which is connected through toothed gearing to the type wheel 37. Obviously 11 and 12 stops 35 may or may not be used, nevertheless they are usually provided for the contingency of printing an interpretation of British or English currency.

The second, or alphabet code is interpreted in a similar manner for the first half of the alphabet. (See Fig. 14.) In this case the spring urged measuring element 36 is limited by a raised stop 35 in the path of the pawl 38 pivoted to element 36. In the case of the latter half of the alphabet the 12 stop 35 is raised as well as one other. In this case the 12 stop elevates the pawl 38 so that the extreme end of element 36 abuts against the positioned stop, thus permitting an excess of movement equivalent to about half the pitch of the stops 35. The structure of Fig. 14 is shown in its position of full travel. Under normal operating conditions, the member 36 is drawn to the extreme right by the bail member 30 of Figs. 2, 3, 5, 8, 19 and 26. With the member 36 in the right-hand position, one of the stops 35 (except the one marked "12") may be elevated, whereupon the bail 39 may be released and the end of the member 38, as shown, will be arrested by the raised stop 35 to give a desired number. If, however, the stop member 12 is also raised, the member 38 being pivoted on the member 36 will be raised above the ends of the stops 35 and the end of the member 36, shown adjacent to the member 38, will contact with the edges of the stops 35. It may be noted that the end of the member 38 projects beyond the end of the member 36 by an amount substantially equal to half of the pitch, or distance of separation of the stop members 35. Say, for example, the four is elevated, the member 36 will advance to a given point until the end of the member 38 contacts with the stop to position the wheel 37 for the printing of a given letter. If, however, the stop 35 numbered 12 is also raised, the swinging member 38 is elevated, allowing the member 36 to advance a half pitch step further, thereby bringing the next adjacent character on the wheel 37 into printing position. The type wheel 37 is driven as before. Obviously the characters thereon are arranged with the second half of the alphabet interspersed with the first half. (See Fig. 29.) Certain rarely used or strikingly similar characters are combined, for example O and Q; U and V; X and Z, as is indicated in Figs. 29, 30, 31, 32 and 33. The last two columns will be explained at the end of the next paragraph for it is really a combination of the described alphabetic code and the 90-column numerical code.

The third and fourth, or 90-column codes are interpreted in a manner analogous to that used for the last half of the alphabet, except that the provision of the half-pitch movement is effected by the particular arrangement of the stops 35. (See Figs. 8, 15, and 25.) All the odd digits are interpreted in exactly the manner described for the first code by the positioning of a single stop 35. The even digits are interspersed with the odds, therefore, an increase in movement of a half stop pitch will suffice to interpret them. The extra movement is attained by elevating either the 3 or the 9 stop, or both. Each of these stops is arranged with a trapezoidal projection, (see Fig. 25) whose narrow side normally rests against a fixed pin, but when such stop is raised the corresponding spring urged measuring member 36 will travel an additional

half stop pitch by shifting the positioned stop 35 until the stem of the 3 or 9 stop contacts with the said pin. The stop members 35 are free to move up and down between the limits set by the guide pins 350, and are also free to move side-
 5 wise between the limits set by the guide pins 350 as adjusted by the top portion of the stops 35. The type wheels 37 have their type arranged in the natural order, and each is operated through
 10 an intermediate segment gear by corresponding spring urged measuring elements 36.

The relative positions of the main operating elements during different phases of the cycle of operation of this invention are illustrated in
 15 Fig. 13 and will be described hereinafter.

Inspection of a perforated card reveals that control or special perforations are indistinguishable from regular perforations. Indeed, control or special perforations are merely regular perforations sensed in the usual regular manner, but in tabulating machines the interpreters in the multiple translator lead to various special mechanisms. Examples of such are those shown in the
 20 copending applications S. N. 535,842, filed May 8, 1931, and S. N. 576,992, filed November 23, 1931. The interpretation of special perforations is, therefore obtainable by a mere interchange of
 25 type wheels 37 with corresponding arbitrary or suggestive indicia indicating the particular purpose for which the control hole is to be used. Examples of special indicia are suggested in the table for interpreting control perforations as
 30 shown on page 19.

A sample of the work performed by the machine is illustrated in Fig. 24, where both alphabetic and combinational code printing are illustrated.

In many instances descriptive indicia such as "Dz", "Oz.", "lb", "Gl.", "Qt.", etc., etc., are
 40 used in alphabetical or descriptive fields and each indicia is assigned a particular perforation position, therefore, such can be interpreted in substantially the same manner as described above by constructing type wheels 37 to correspond to
 45 the special characters or indicia.

Three hole alphabetic code

It is possible to record the alphabet in upper and lower fields in a manner generally analogous
 50 to the upper and lower fields of the 90 column system, as shown in Fig. 31. This is shown in detail in Fig. 33.

The sensing and mechanical interpreting of the alphabetic three hole code is best shown in
 55 Figs. 26 and 27, the sensing of the first half of the alphabet is essentially the same as in the case of upper and lower numerical codes. Thus A and 1 correspond, B and 2 correspond, etc., for substantially the first half of the alphabet. The mechanism for effecting this sensing consists of
 60 the usual set of "odd" stops 12, 11, 0, 1, 2, 3, and 4, 5, 6, 7, 8, 9 positions combined with the 3 and 9 stops respectively. It is to be noted however, that when a 3 or 9 stop is projected, or set, the measuring elements 36 stop short of the position
 65 they would have attained if the said 3 or 9 stop had not been projected, therefore, B precedes A, etc., as shown in the developed peripheries of the type wheels as shown in Fig. 28. The 12 and 4 stops have "flags" or offset projections carrying
 70 cams for further limiting the normal advance of the measuring elements 36. The flags have their ends offset to lie behind the thin plate 40 similar to that of lever 39. Included between
 75 the 12 and 3 stops is a pivoted floating element

or stop shifter 59 which is shifted an extent equal to double the distance that the 3 stop shifts the remaining stops when the said 12 stop is projected, thus generating a second set of direct and combination positions corresponding to the normal 9 positions of the numerical stops, thus generating the second half of the alphabet. Now these two combinations generate 18 separate positions, but an extra one (L) is attained when the 12 (or 4) stop alone is projected, thus generating 19 separate and distinct positions. A twentieth position may be said to exist when none of the stops are projected, but such is absorbed into the blank or no character position. Similarly for the lower half of the card, it is necessary to make combinations of similar characters in the 90-column alphabetic code.

Any column on a card to be interpreted may have its perforations generated by any of a plurality of codes. It is, therefore, necessary to have an interpreting plate for each code, and for each column. In the present instance there are six codes described for the purpose of illustrating one form of the invention, but it is to be understood that other codes may be used. The details of the plates are shown in Figs. 4, 8, 14, 15, 16, 25 and 26. Each card column has the width shown in Fig. 24, (approximately 4 mm.) therefore, each plate must have all its mechanism "compressed" into this width. Each plate comprises a metal sheet having a thickness approximately $\frac{1}{3}$ (a little less) of this width on which is mounted the type wheel (or wheels) 37 having a thickness of about two thirds of the 4 mm. spacing; one or more spring urged measuring members 36, each of which is permanently geared to one of said type wheels; a set of stops, 35, to govern the extent of movement of the measuring elements 36; a guide frame for said stops; and a stop restoring lever 39. Each stop 35 is provided with two extruded pins extending in opposite directions, the one underlying the lever 39 so that said lever can positively restore said stops, the other (350) extending through an oblong hole in the supporting plate (Fig. 4) to limit the up-and-down movement of the stops 35. Each set of stops is retained by a thin plate 40 fixed to the metal plate in any suitable manner, and each set is located so as to be above the corresponding set of sensing pins of the pin box (Figs. 4 and 8). Said plate also serves to guide one end of the measuring element as in Figs. 14 and 16. Each measuring element 36 is connected by comparatively long and strong springs to a lug or hook on the corresponding plate. The universal restoring bar 50 lies under said spring but above the measuring elements as shown in Figs. 2 and 8. The extreme upper corners of each plate have projections to determine their positions in the framework of machine (Figs. 2, 4 and 6) and each end of each plate is recessed to permit a grooved sliding bolt 41 to be slid a short distance to lock each plate in the framework of the machine.

Each type wheel 37 contains a short or blank type which ordinarily carries no indicia. This position corresponds to the projection of no stop and hence no printing or interpreting. If desired a special character may be used to indicate the absence of column or perforations. Each of the type wheels contain several blanks which may be used for control or special perforation interpretation.

The terms "record sensing mechanism" and "sensing pins" are used in many of the claims. Applicant intends that the term "record sensing

mechanism" include any reading device such as mechanical feeling pins, electrical brushes, electrical contacts, etc., to read or sense an abnormality in the record, whether such abnormality be perforations, conducting spots or marks, embossings, notches, etc., and that the term "sensing pins" include the appropriate detecting mechanism for locating the aforementioned abnormalities.

The mechanism has been illustrated and described as a printing interpreter or verifier. It is, however, manifest that other modes of imparting information may be used instead, such as arbitrary marks or signs, lighting one or more electric lights, etc. Such are obvious equivalents and are, therefore, not illustrated.

Timing

The timing of the machine is simple and straight forward. The timing diagram of the principal elements is shown in Fig. 13 in which that point in the cycle where the sensing box 10 is just starting upward has been more or less arbitrarily selected as the zero point. At that point a card is approaching the card stop in the sensing chamber, said card having been started from the magazine by the picker at about 176° of the preceding cycle of shaft 22, as indicated by the dot-dash line in Fig. 13.

It will be seen that the traverse of a card from the magazine to the discharge receptacle, occupies about one and one-half cycles, so that, in the second half of each cycle, two cards are going through the machine at the same time. This makes for speed of operation. The complete timing is represented by the following table of 18 divisions:

1. Sensing box rising slowly, card traveling into sensing chambers.
2. Sensing box continues to rise, card reaches card stop 12.
3. Sensing box continues to rise, card against stop.
4. Sensing box reaches highest position, pins 14 elevated and latched. Universal bar 30 begins forward excursion.
5. Sensing box begins rapid descent, card stationary, bar 30 advancing, pins 14 latched.
6. Sensing box down and remains down for remainder of cycle, bar 30 advancing, card traveling out of sensing chamber, pins 14 latched, card stops 20 begin slow rise.
7. Card traveling into printing chamber, bar 30 advancing, card stops 20 rising, pin 14 latched.
8. Card traveling into printing chamber, bar 30 advancing, card stops 20 rising, pins 14 latched.
9. Card reaches stops 20, bar 30 reaches extreme advancement, platen 17 starts slowly upward, pins 14 latched, card picker feeding second card into the sensing chamber.
10. Card stationary, bar 30 stationary, platen rising slowly, pins 14 latched, second card traveling.
11. Card stationary, bar 30 stationary, platen rising slowly, pins 14 latched, second card traveling.
12. Card stationary, bar 30 stationary, printing occurs, and platen starts down, pins 14 latched, second card traveling.
13. Card stationary, bar 30 starts return, platen rapidly dropping, pins 14 latched, second card traveling.

14. Card stationary, stops 20 being quickly retracted, bar 30 returning, platen down and remains down during remainder of cycle, pins 14 latched.
15. Card traveling out of printing chamber, bar 30 returning, card stop down, pins 14 latched, second card traveling.
16. Card traveling out of printing chamber, bar 30 returning, pins 14 latched, second card traveling.
17. Card out of printing chamber, bar 30 returning, pins 14 latched, second card traveling.
18. Card out of printing chamber, bar 30 returning, pins 14 unlatched, second card traveling.

The operation of the ribbon mechanism is not included, inasmuch as it may operate at any time except during printing.

Switch mechanism

The machine is provided with an improved electric switch whereby the manual operations of opening and closing an electric circuit are identical. It has been mentioned hereinabove that the machine is either started or stopped by depressing lever 5. The said lever overlies a spring urged plunger 74 (Fig. 3) on which is pivoted an "over-the-center" element 75, having engaging hooks on its opposite sides. Assuming the circuit broken as in Fig. 3, then depression of the plunger 74 causes one hook 76, of element 75, to engage a pin on the spring-biased pivoted arm 77 and a rocking thereof. As arm 77 is rocked, the upwardly extending arm of the spring-held bell-crank 78, pivoted on the rearward extremity of the loosely pivoted arm 79, which carries the circuit closing member 80, engages a notch in bell-crank 55, thereby delaying the actuation of circuit closing member 80 until the pawl-like rearmost end of arm 77 has almost reached its corresponding slot in bell-crank 55, at which point the end of arm 81 (of arm 77), engages the lower arm of bell-crank 78, thereby rocking said bell-crank 78 out of engagement with bell-crank 55, thus allowing spring 82, which is attached between arms 77 and 79, to rock arm 79 with a sudden snap, thereby closing the circuit.

The release of bell-crank 78 and the engagement of the end of arm 77 with its notch in bell-crank 55, occurs almost simultaneously. As the circuit-closing member 80 snaps to its effective position, the loosely pivoted lever 83, which is connected by a spring to circuit-closing member 80, is caused to shift and through a link, to shift the over-the-center element 75 to a position where its other hook will be over a pin in bell-crank 84. The circuit will now remain closed until either the card-presence sensing mechanism or the manual mechanism is actuated to operate bell-crank 55 and thereby allow spring 85 to rock arm 77 to effect a movement of circuit-closing member 80 to break the circuit.

When plunger 74 is depressed a second time to effect the breaking of the circuit the action is quite obvious in Fig. 3; the right-hand hook of element 75 engages the pin of bell-crank 84, to shift link 86, to actuate bell-crank 55 to release circuit closing element 80.

When the circuit closing element 80 is snapped to its ineffective position, lever 83 shifts hook 76 back to a position over its corresponding pin

on arm 77, thereby completing the set-up of the switch mechanism for another circuit-closing operation.

Ribbon mechanism

5 The entire ribbon mechanism (without a threaded ribbon) is a separate unit attachable to one of the main frames of the machine. It will be remembered that the actuating pawls or racks 59 (Figs. 18, 21, 22, and 23) are driven from the shaft 58, which, in turn, is driven by cam 56 on the main shaft 22. Only one of the members 59 can be in engagement with a ratchet wheel of the ribbon spools, the other is held out of engagement by the corresponding complementarily arranged crank 63. The cranks 63 are rigidly mounted on shafts on which is mounted a reversing "gear" whose operation is controlled by the amount of ribbon wound on a spool. Each ribbon spool is provided with a resiliently urged feeling finger 64 having a stud at its upper end for shifting a corresponding spring pressed pawl 65 against its spring. When a spool is nearly empty the corresponding pawl 65 is shifted into engagement with a turned over lip on the corresponding arm 66 fixed to the power oscillated shaft 58, and hence the said pawl is drawn upwardly to actuate the reversing mechanism. Each pawl 65 is pivoted to an arm 67. One of the arms 67 is directly fixed to the shaft carrying the cranks 63, the other is loose on this shaft but fixed thereto indirectly through a reversing gear which consists of:—(1) a laterally extending lug on the last mentioned arm which extends into the narrow part of a key hole slot in, (2), a reversing lever 68 (Figs. 22 and 23) one of whose arms is held stationary in a slot in the framework and whose other arm is pivoted to, (3), an arm 70 fast to the shaft carrying the crank 63. It is evident that when one of the pawls 65 is drawn upwardly the other is forced downwardly through the intermediary of the described reversing linkage. A suitably located spring urged flexible retaining pawl 71 is loosely pivoted on the shaft 58 and the corresponding cooperating retainer is fixed to the shaft of the cranks 63.

The ribbon path is as follows:—(Figs. 18, 19, 20, 21, and 22).

- (a) downwardly from the ribbon supply spool,
- (b) over a ribbon guide,
- (c) across the top of an impression pad on the platen 17, but over the card in the printing chamber and under the printing wheels 37,
- (d) over a ribbon direction changer 73,
- (e) across the top of the other impression pad on the platen 17 between the card and the type wheels,
- (f) over a ribbon guide,

(g) upward to the receiving spool which is driven by the above described ribbon mechanism. In order to prevent the card from sticking to the type wheels a series of card fingers 72 (Fig. 18) are fixed to the upper plate of the printing chamber. The dimensions of these fingers is such that they can freely pass between the adjacent type wheels 37 without interfering with their action.

70 What I claim as new and desire to secure by Letters Patent is:

1. In an interpreting machine the combination of a record sensing mechanism for sensing perforated records, means for temporarily preserving a sensed reading and a plurality of in-

terchangeable perforation interpreters adapted to be controlled by the means for temporarily preserving a sensed reading.

2. In an interpreting machine the combination of a record sensing mechanism, an impression mechanism for recording from types, and any one of a plurality of interchangeable perforation interpreters of differing type adapted to be controlled by the sensing mechanism for selecting determinable type from which an impression is to be made.

3. In an interpreting machine the combination of a record sensing mechanism for sensing any of a plurality of codes of perforations, a printing mechanism for making a record from type, and an interchangeable perforation interpreter adapted to be positioned to be controlled by said sensing mechanism for controlling type arranged to interpret the character represented by the perforations sensed by the said sensing mechanism.

4. In a machine of the class described the combination of a record sensing mechanism for sensing a plurality of groups of perforations arranged according to a plurality of codes of perforations, a printing mechanism for simultaneously printing a plurality of indicia representable by types, and perforation interpreters for each gamut of indicia of each code.

5. In a machine of the class described the combination of a record sensing mechanism for sensing each character in a plurality of gamuts of perforation codes, a printing mechanism for printing each character in a plurality of gamuts of codes, and optionally interchangeable columnar perforation interpreters controlled by said sensing mechanism for determining the characters recorded by said printing mechanism.

6. In a machine of the class described an interchangeable perforation interpreter adapted to be controlled by a record sensing mechanism and to control type for a printing mechanism including a type element, a measuring element, and a field of stops operatively mounted on a supporting plate.

7. In a machine of the class described an interchangeable perforation interpreter adapted to serve as an element whereby a set of sensing pins may determine a particular type to be printed by a printing mechanism, including a supporting plate which may be operatively associated with any set of sensing pins, and a field of stops operatively mounted thereon.

8. In a machine of the class described the combination of a series of interchangeable perforation interpreters, a sensing mechanism for perforated records, and a printing mechanism controlled by said sensing mechanism through said interpreters for printing at predetermined locations on the controlling perforated record.

9. In a machine of the class described the combination of a series of interchangeable perforation interpreters, a sensing mechanism for perforated records, and a printing mechanism controlled by said sensing mechanism through said interpreters for printing at predetermined locations on the controlling perforated record including an adjustable card stop mechanism.

10. In a machine of the class described the combination of a series of interchangeable perforation interpreters, a sensing mechanism for perforated records, and a printing mechanism controlled by said sensing mechanism through said interpreters, for printing at predetermined locations on the controlling perforated record,

an interpretation of the perforations in the record.

5 11. In a machine of the class described the combination of a series of interchangeable perforation interpreters, a sensing mechanism for
10 12. In a machine of the class described a stop mechanism for controlling a differentially adjust-

able type carrier comprising a series of stops and a group of stop shifters whereby any stop of the series of stops will control a plurality of differential positions for the adjustable type carrier.

13. In a machine of the class described a stop 5
mechanism for controlling a differentially adjustable type carrier comprising a series of stops and a group of stop shifters whereby any stop of the series of stops will control a plurality of "consecutive" differential positions for the adjustable type carrier including camming stop 10
members.

WILLIAM W. LASKER.