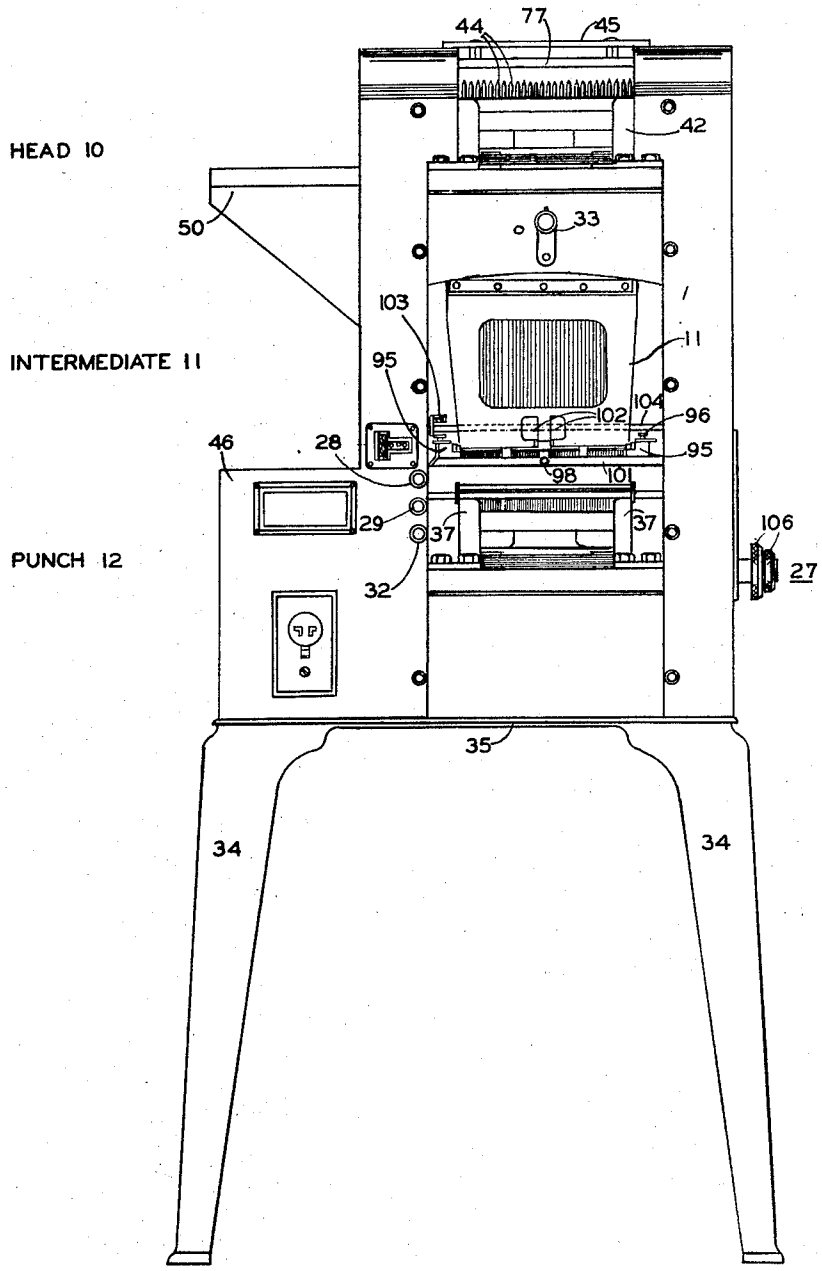
Feb. 15, 1938. W. W. LASKER 2,108,681

CONVERTING AND TRANSLATING PUNCH

Filed July 18, 1933 38 Sheets-Sheet 1



WITNESSES

H. D. Hineline

Fig. 1.

Inventor

William W. Lasker

by Clifton H. Killian

Attorney

Feb. 15, 1938. W. W. LASKER 2,108,681

CONVERTING AND TRANSLATING PUNCH

Filed July 18, 1933 38 Sheets-Sheet 2

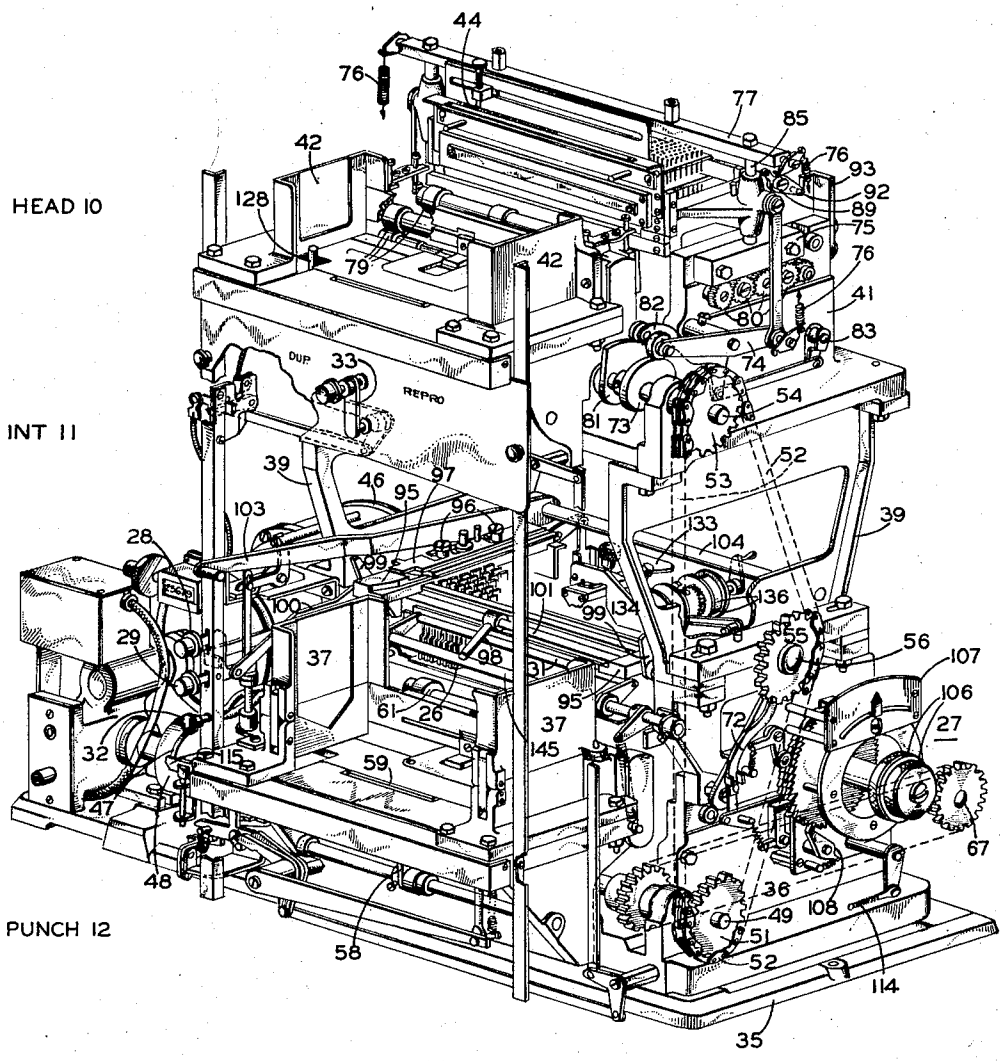


Fig. 2.

WITNESSES

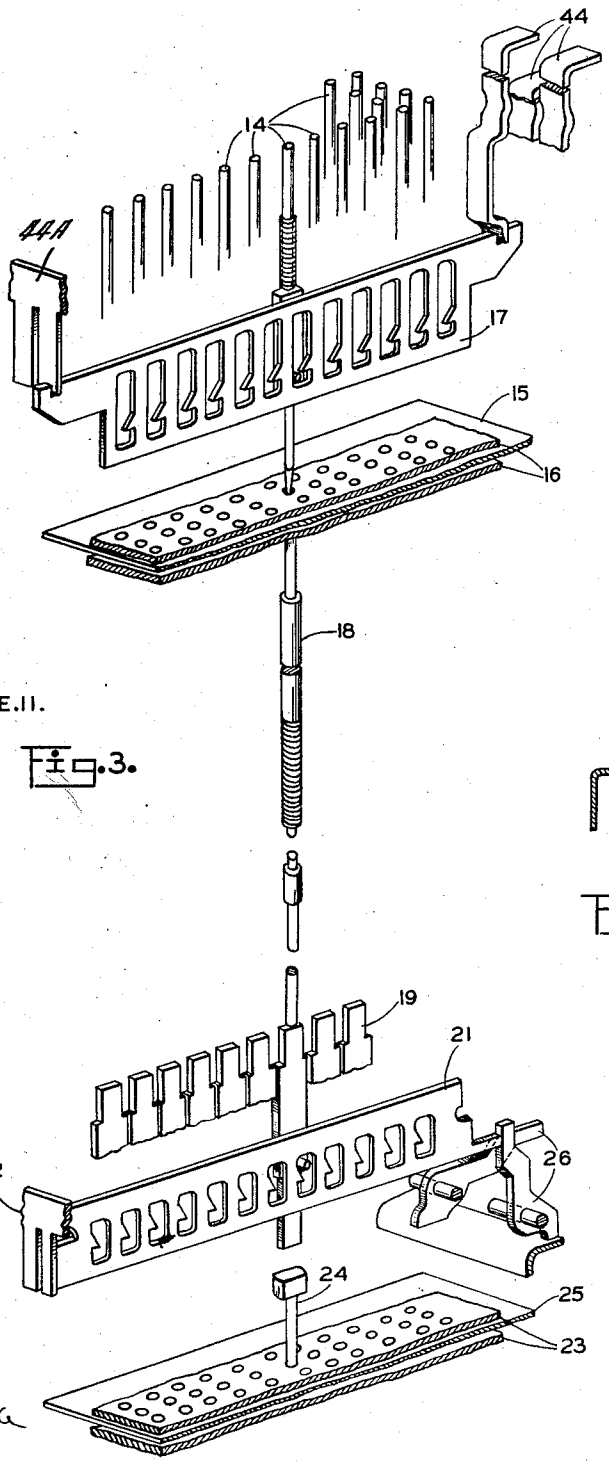
H. D. Hineline
Dorothy Rourke

Inventor
William W. Lasker
by
Clarence A. Willman
Attorney

Feb. 15, 1938. W. W. LASKER 2,108,681

CONVERTING AND TRANSLATING PUNCH

Filed July 18, 1933 38 Sheets-Sheet 3



HEAD.10.

INTERMEDIATE.11.

Fig.3.

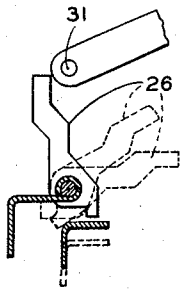


Fig.4.

PUNCH.12.

WITNESSES

H. D. Hinckley

D. M. O'Rourke

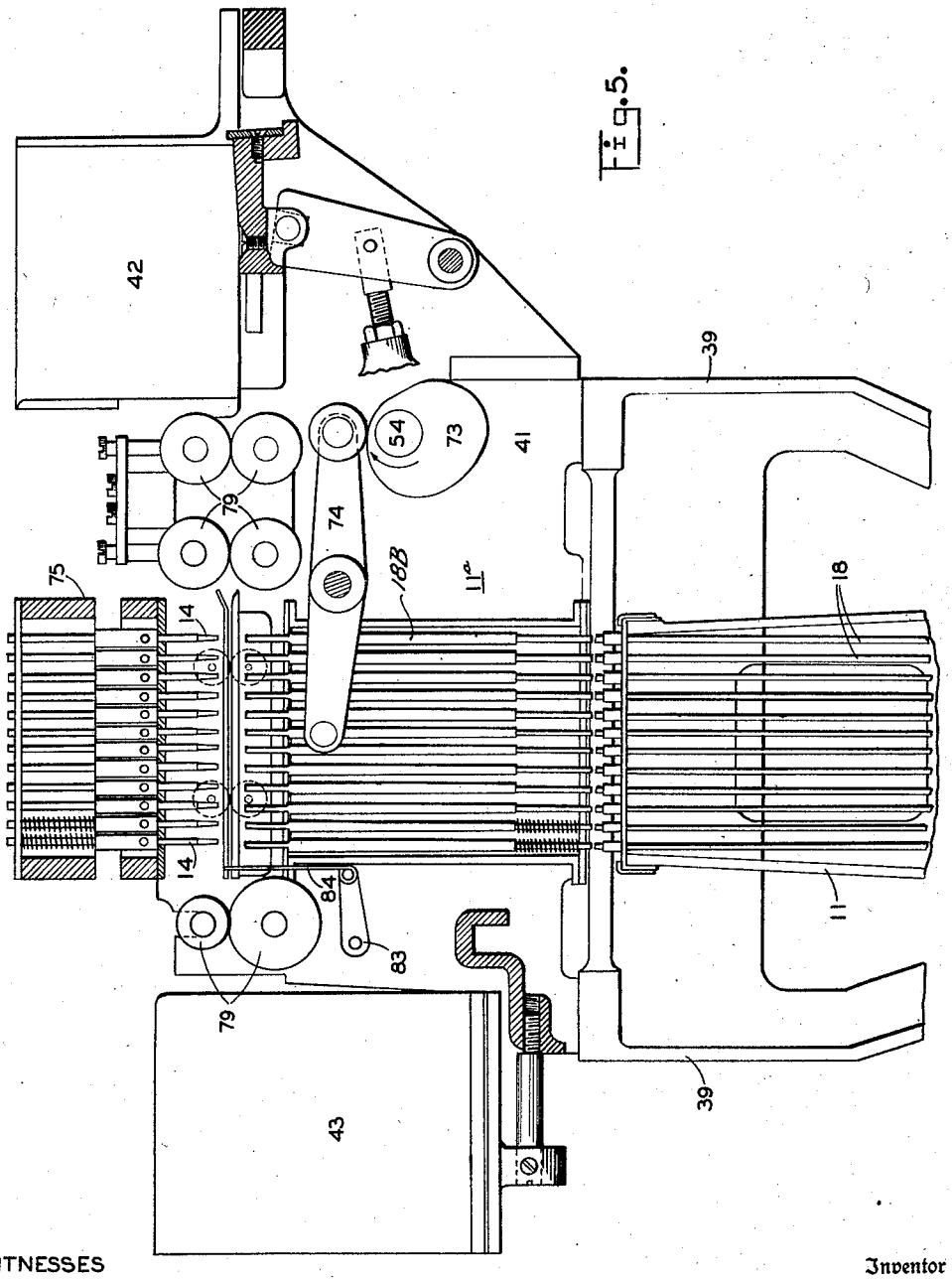
Inventor
William W. Lasker
by
Clarence A. O'Brien
Attorney

Feb. 15, 1938. W. W. LASKER 2,108,681

CONVERTING AND TRANSLATING PUNCH

Filed July 18, 1933 38 Sheets-Sheet 4

FIG. 5.



WITNESSES

H. D. Hinchliffe

D. M. O'Rourke

Inventor

William W. Lasker

by

Clarence A. Willian

Attorney

Feb. 15, 1938. W. W. LASKER 2,108,681

CONVERTING AND TRANSLATING PUNCH

Filed July 18, 1933 38 Sheets-Sheet 5

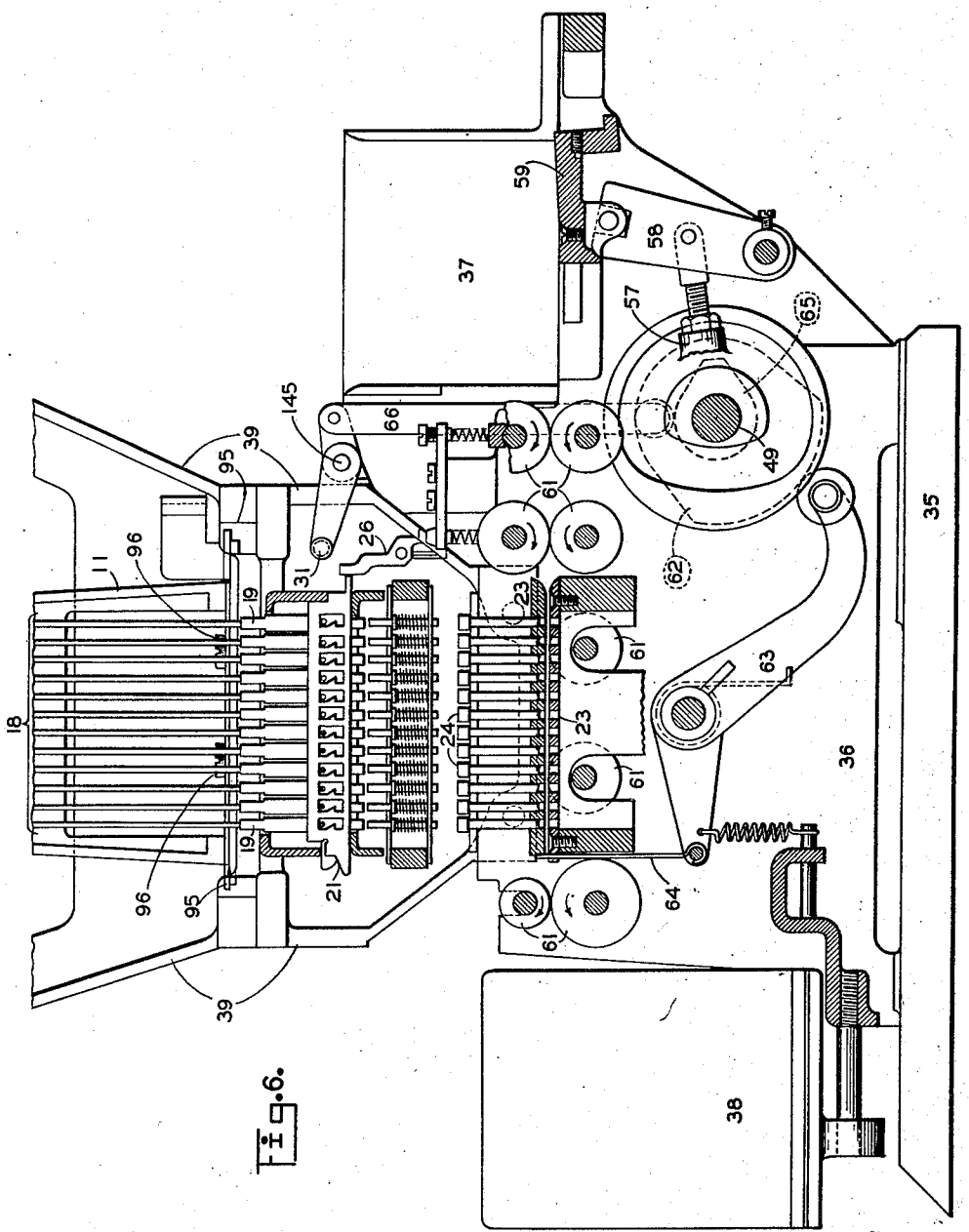


Fig. 6.

WITNESSES

H. P. Hinchline

D. M. Lourke

Inventor

William W. Lasker

by Clarence A. Killian

Attorney

Feb. 15, 1938. W. W. LASKER 2,108,681

CONVERTING AND TRANSLATING PUNCH

Filed July 18, 1933 38 Sheets-Sheet 6

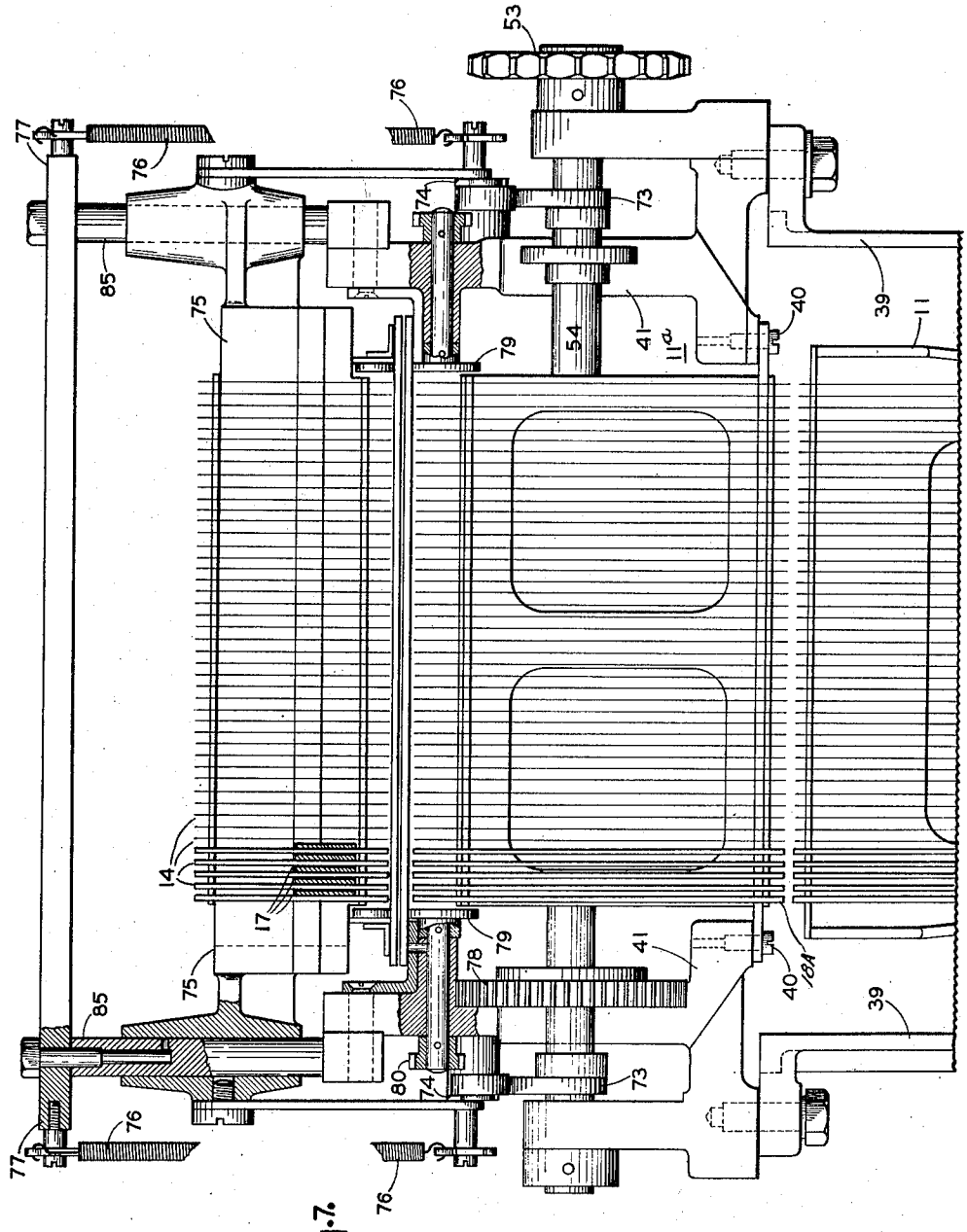


Fig. 7.

WITNESSES

H. D. Hineline

D. M. O'Rourke

Inventor

William W. Lasker

by Clarence A. Willis

Attorney

Feb. 15, 1938. W. W. LASKER 2,108,681

CONVERTING AND TRANSLATING PUNCH

Filed July 18, 1933 38 Sheets-Sheet 7

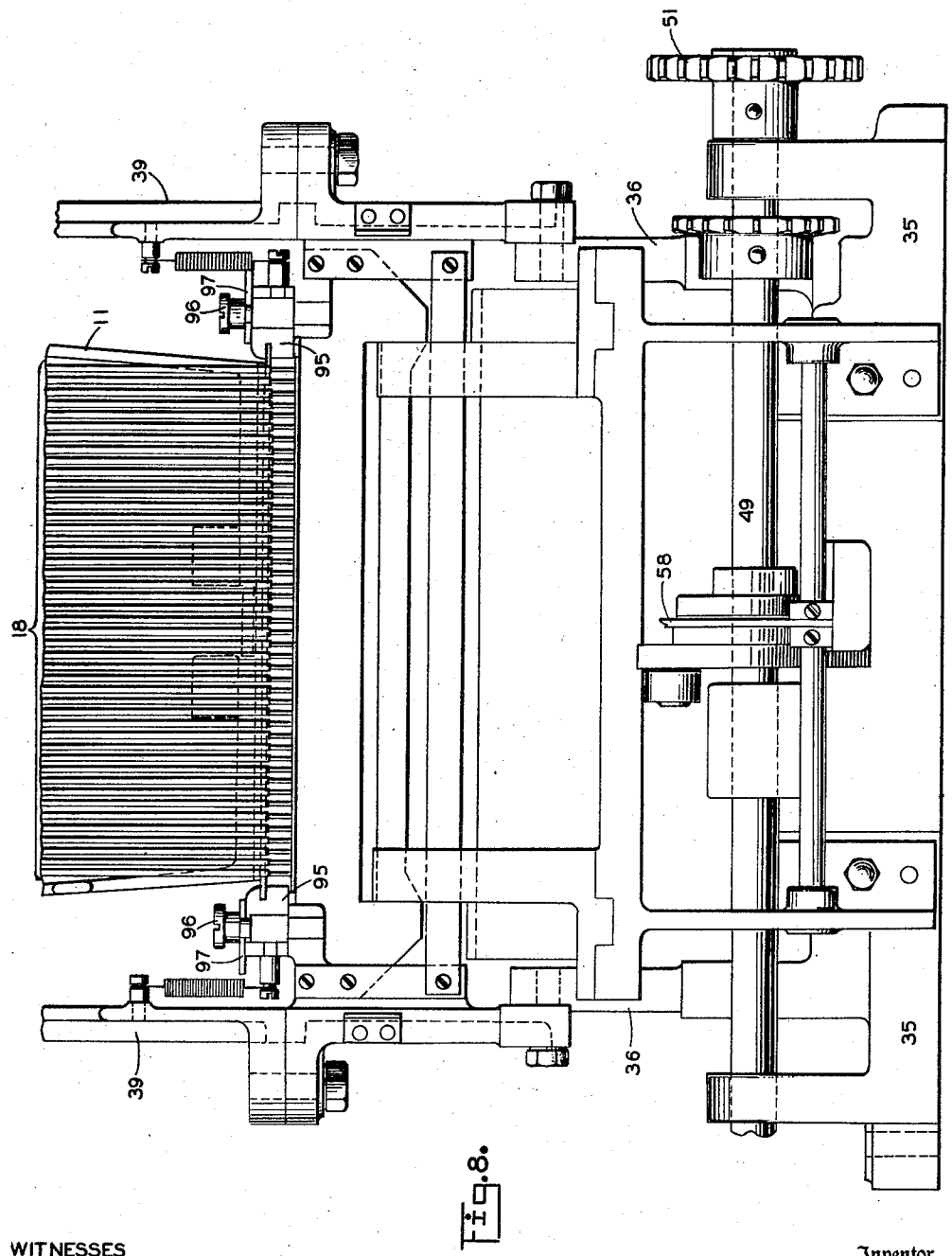


FIG. 8.

WITNESSES

H. D. Hinelein

D. M. O'Rourke

Inventor

William W. Lasker

by

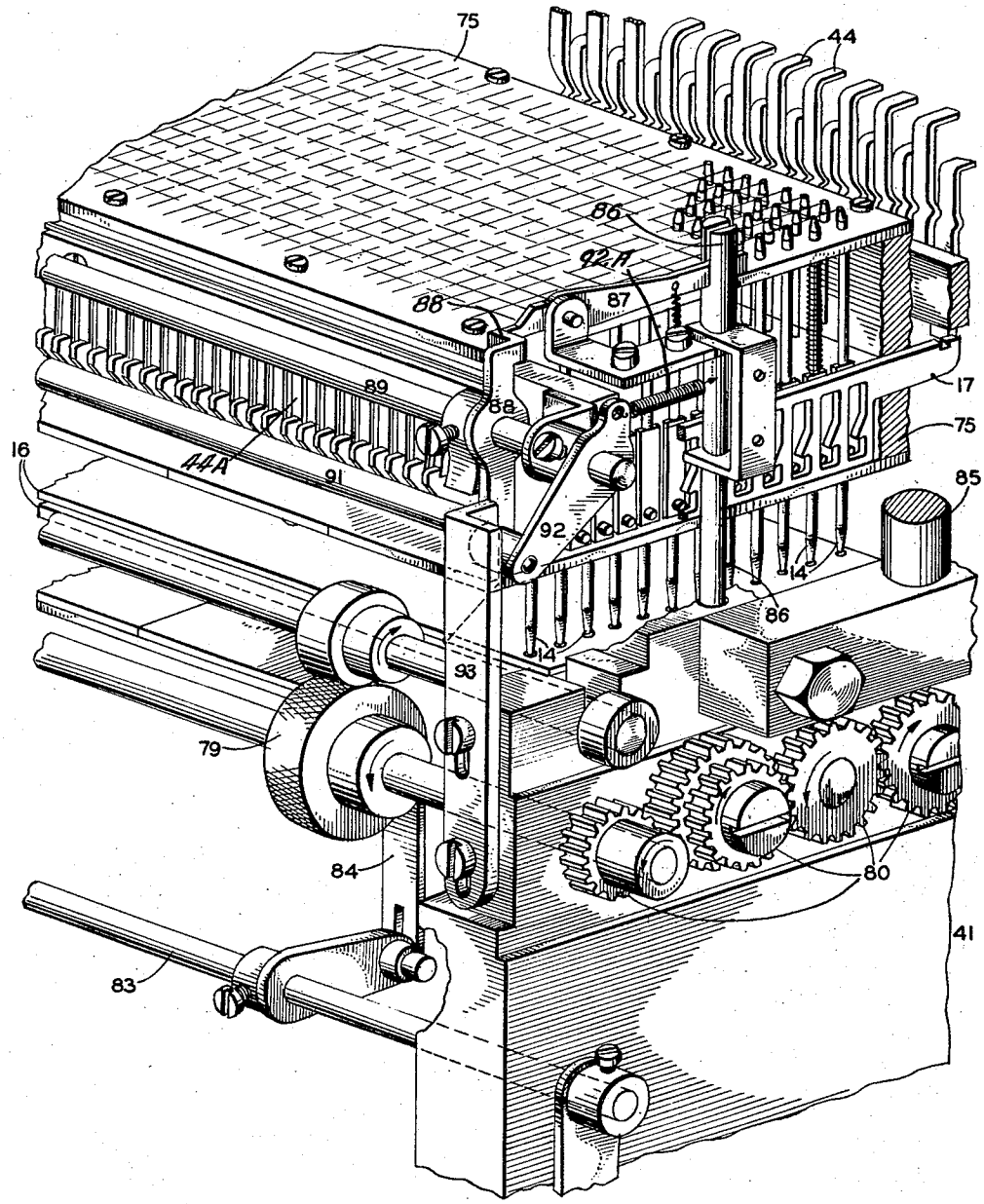
Carlos A. Killian

Attorney

Feb. 15, 1938. W. W. LASKER 2,108,681

CONVERTING AND TRANSLATING PUNCH

Filed July 18, 1933 38 Sheets-Sheet 8



WITNESSES

H. P. Hinelines

Dorothy Rourke

Fig. 9.

Inventor
William W. Lasker

by
Clarence A. Wilkinson

Attorney

Feb. 15, 1938. W. W. LASKER 2,108,681

CONVERTING AND TRANSLATING PUNCH

Filed July 18, 1933 38 Sheets-Sheet 9

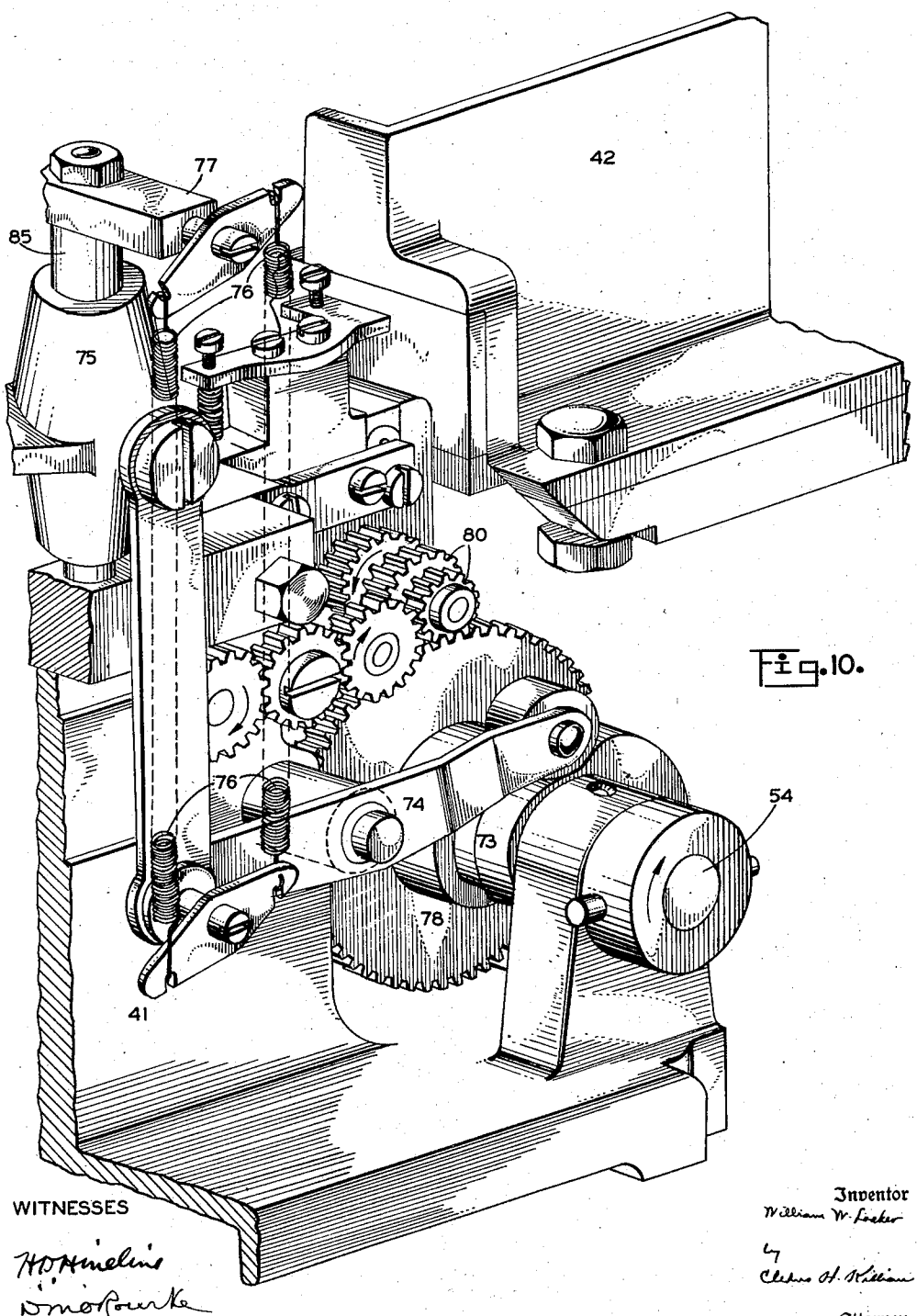


Fig. 10.

WITNESSES

H. D. Hinelins

D. M. O'Rourke

Inventor

William W. Lasker

by

Clarence A. Wilkinson

Attorney

Feb. 15, 1938. W. W. LASKER 2,108,681

CONVERTING AND TRANSLATING PUNCH

Filed July 18, 1933 38 Sheets-Sheet 10

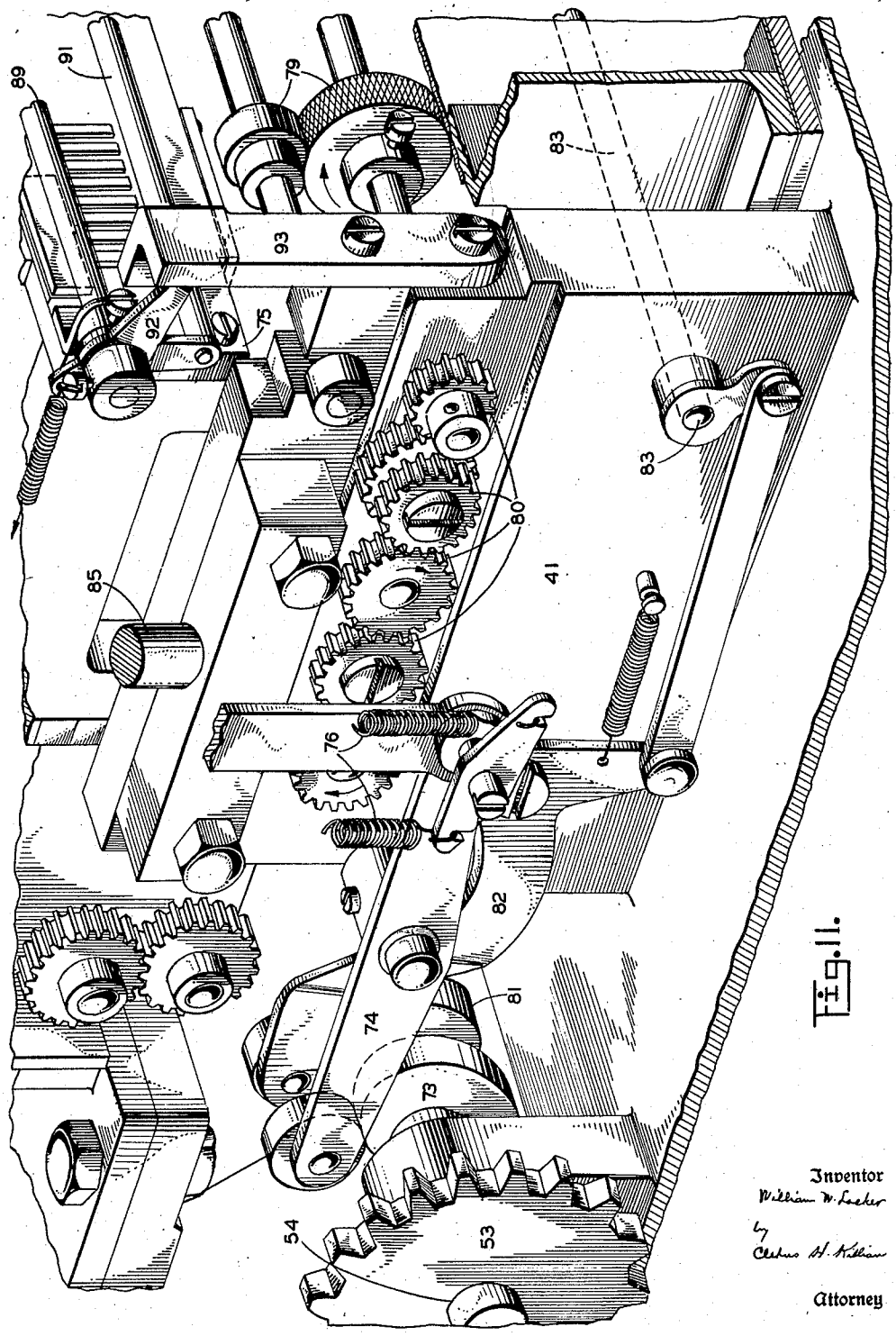


Fig. 11.

Inventor
William W. Lasker
by
Clarence A. Killian
Attorney

Feb. 15, 1938. W. W. LASKER 2,108,681

CONVERTING AND TRANSLATING PUNCH

Filed July 18, 1933 38 Sheets-Sheet 11

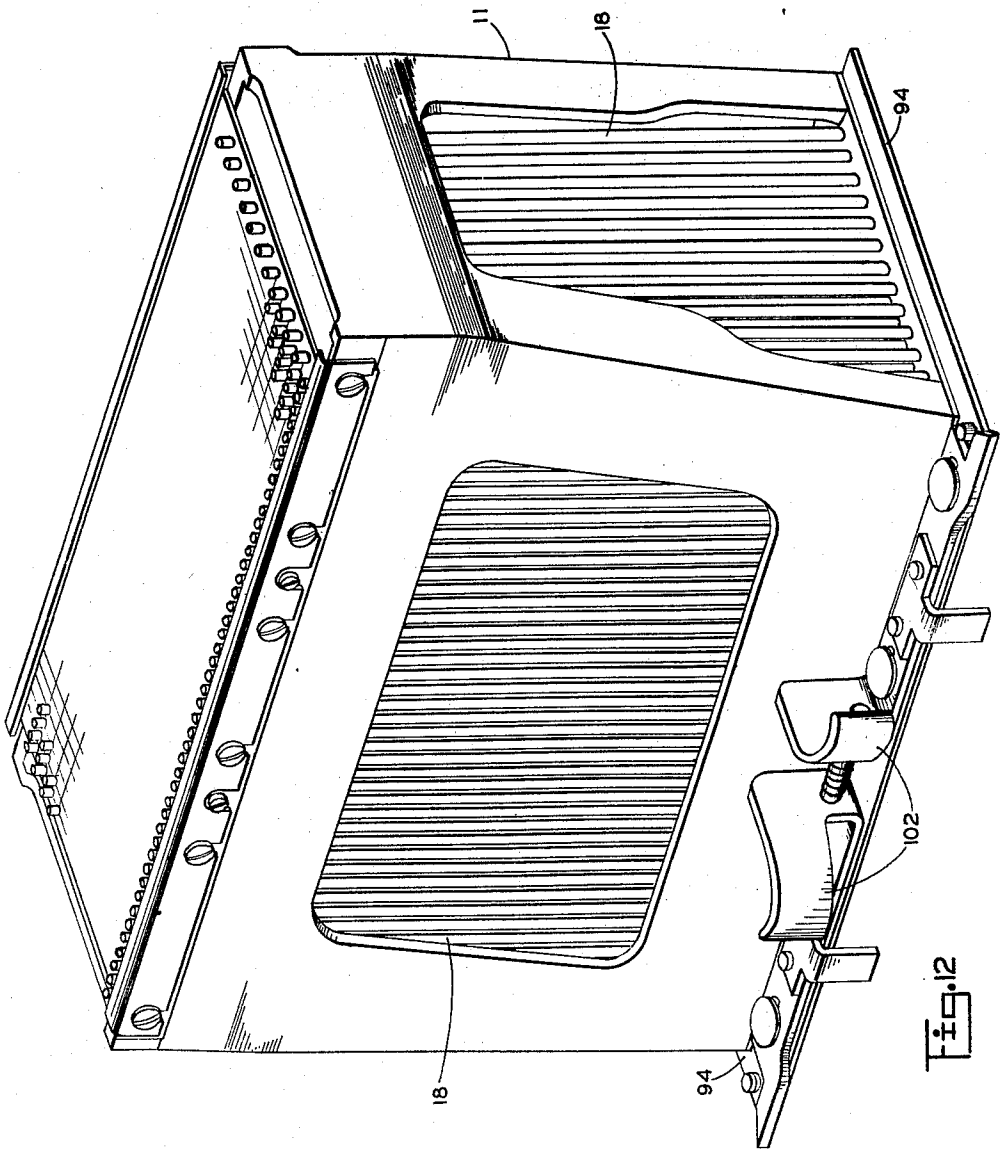


Fig. 12

WITNESSES

H. D. Hinckley

D. M. O'Rourke

INVENTOR

William W. Lasker

by Clarence A. Wilson

ATTORNEY

Feb. 15, 1938. W. W. LASKER 2,108,681

CONVERTING AND TRANSLATING PUNCH

Filed July 18, 1933 38 Sheets-Sheet 12

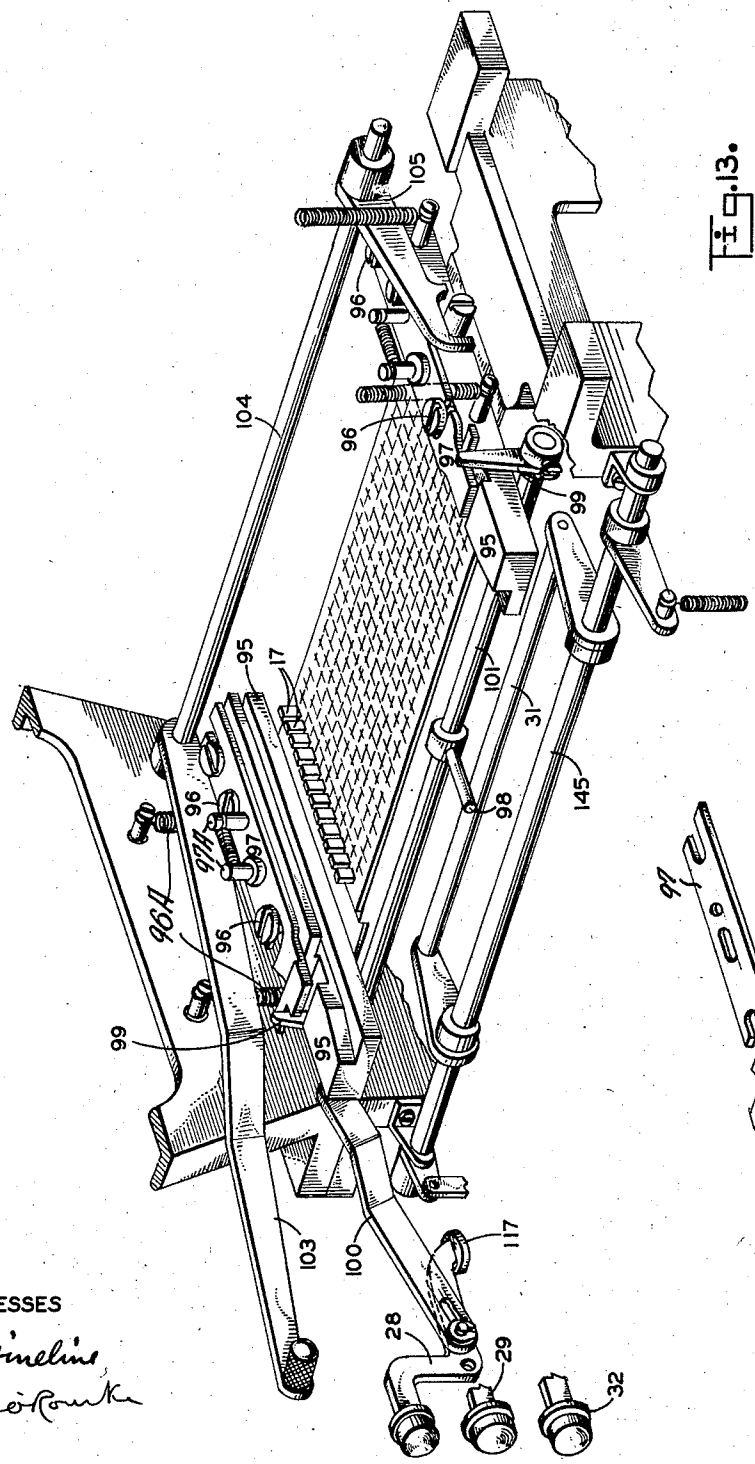


Fig. 13.

Fig. 14.

WITNESSES

H. D. Hineline

Donald Rourke

Inventor
William W. Lasker
by
Clarence A. Wilkinson
Attorney

Feb. 15, 1938. W. W. LASKER 2,108,681

CONVERTING AND TRANSLATING PUNCH

Filed July 18, 1933 38 Sheets-Sheet 13

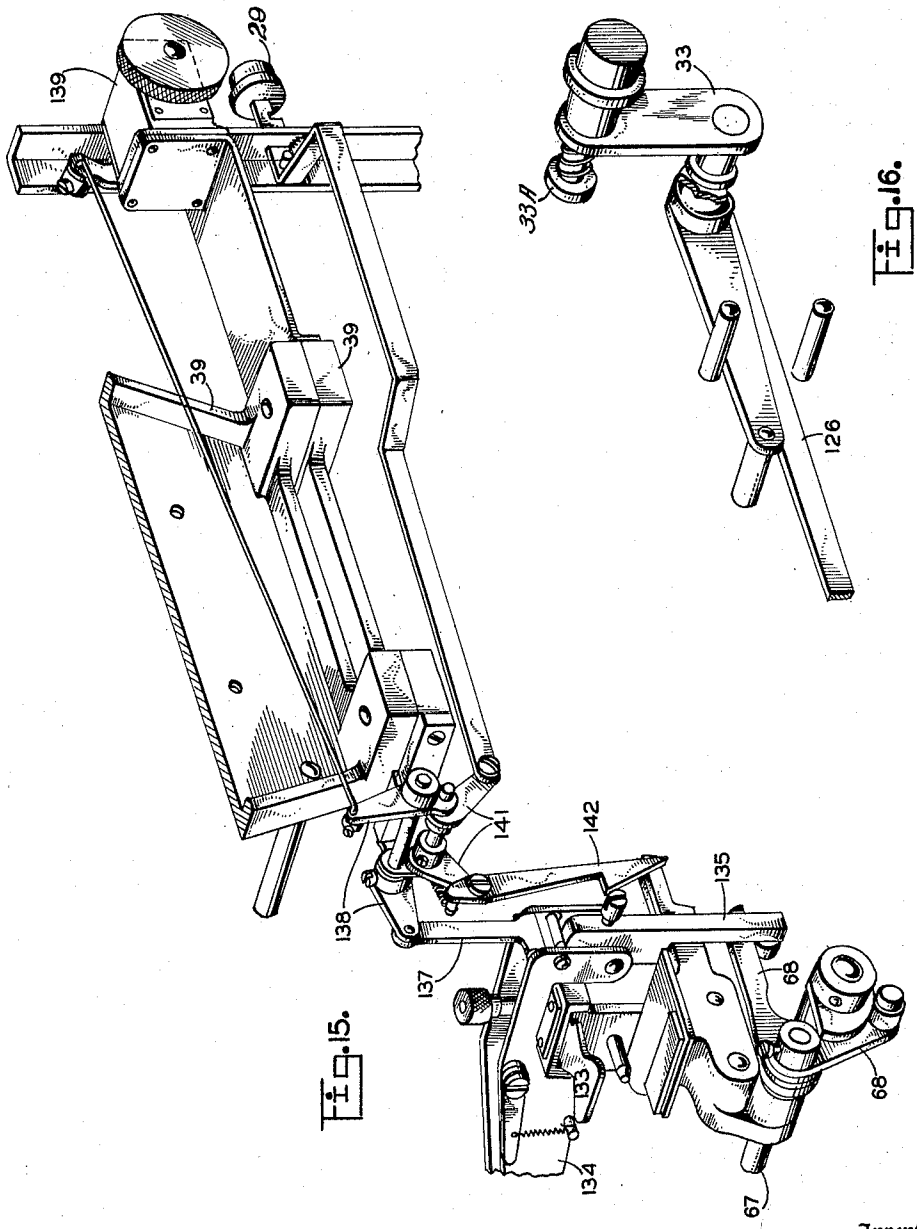


Fig. 15.

Fig. 16.

WITNESSES

H. O'Hmeline

D. M. O'Rourke

Inventor

William W. Lasker

by Charles A. Killian

Attorney

Feb. 15, 1938. W. W. LASKER 2,108,681

CONVERTING AND TRANSLATING PUNCH

Filed July 18, 1933 38 Sheets-Sheet 14

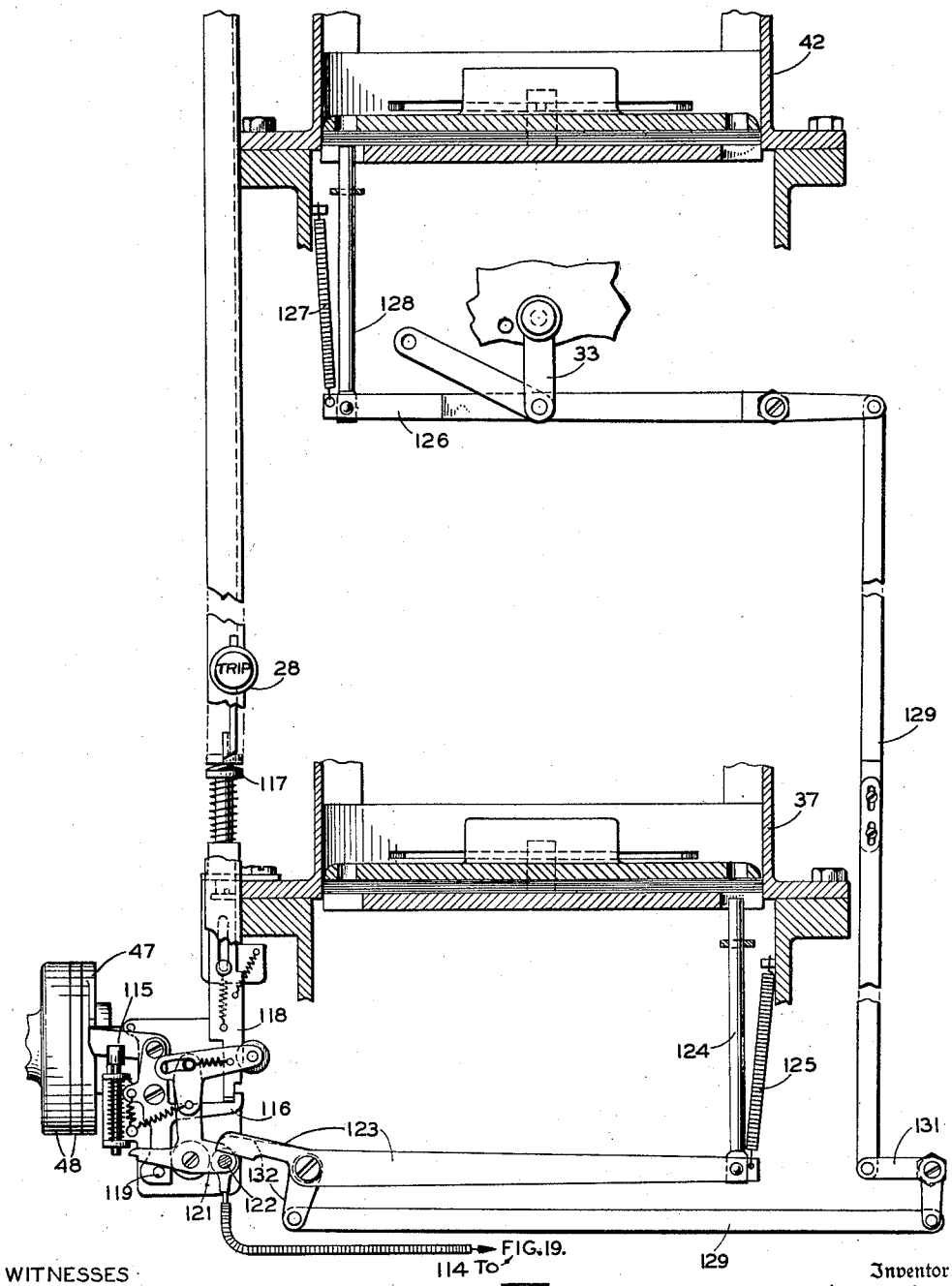


Fig. 17.

WITNESSES

H. D. Hinckley

Dorothy Rourke

Inventor

William W. Lasker

by

Cledus A. Williams

Attorney

Feb. 15, 1938. W. W. LASKER 2,108,681

CONVERTING AND TRANSLATING PUNCH

Filed July 18, 1933 38 Sheets-Sheet 15

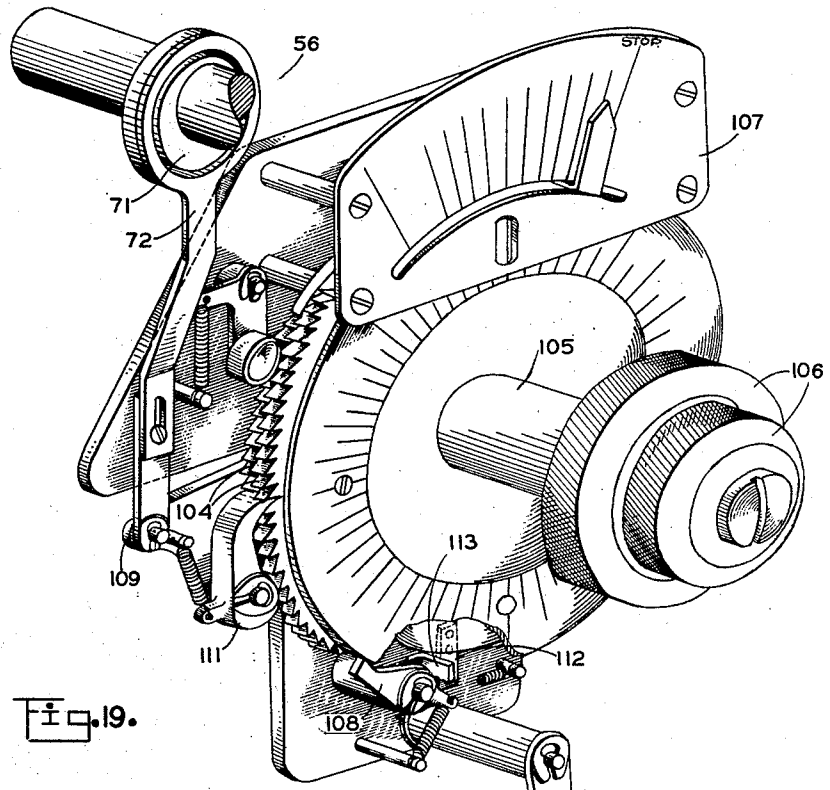


Fig. 19.

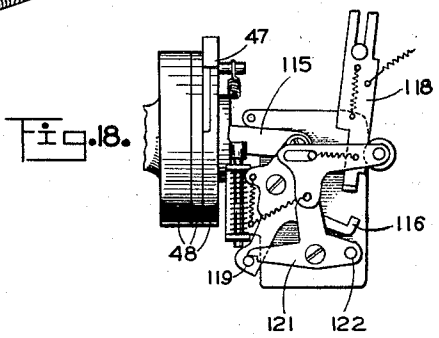


Fig. 18.

WITNESSES

H. D. Hineline

D. W. O'Rourke

Inventor

William W. Lasker

by

Clarence A. Killian

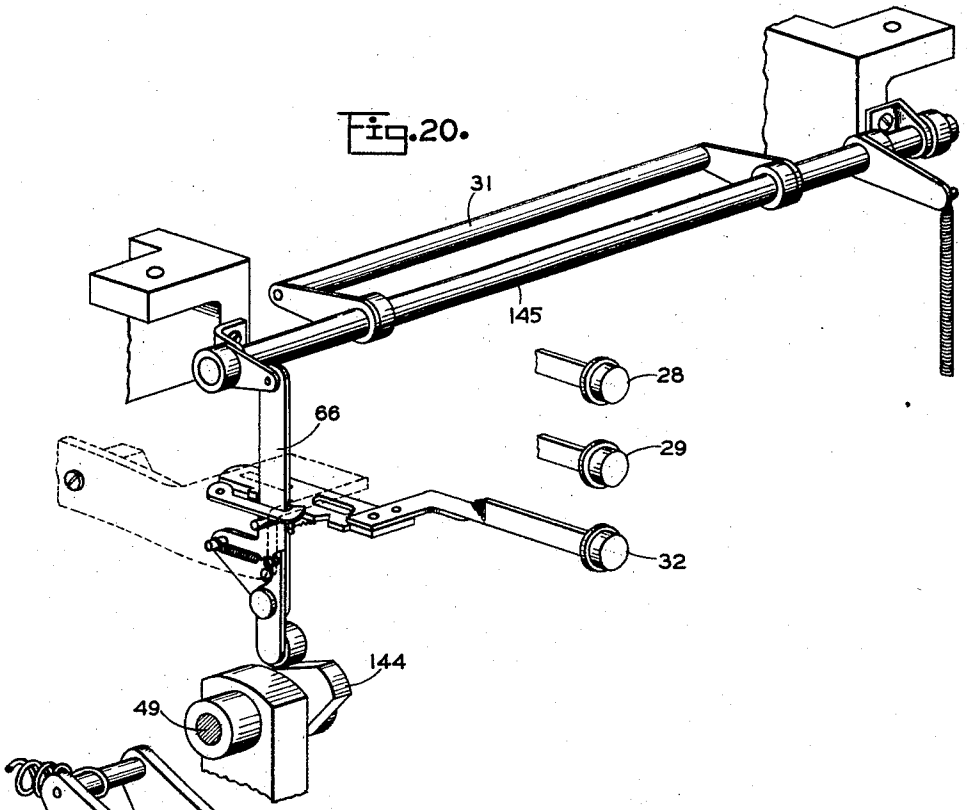
Attorney

Feb. 15, 1938. W. W. LASKER 2,108,681

CONVERTING AND TRANSLATING PUNCH

Filed July 18, 1933 38 Sheets-Sheet 16

Fig. 20.



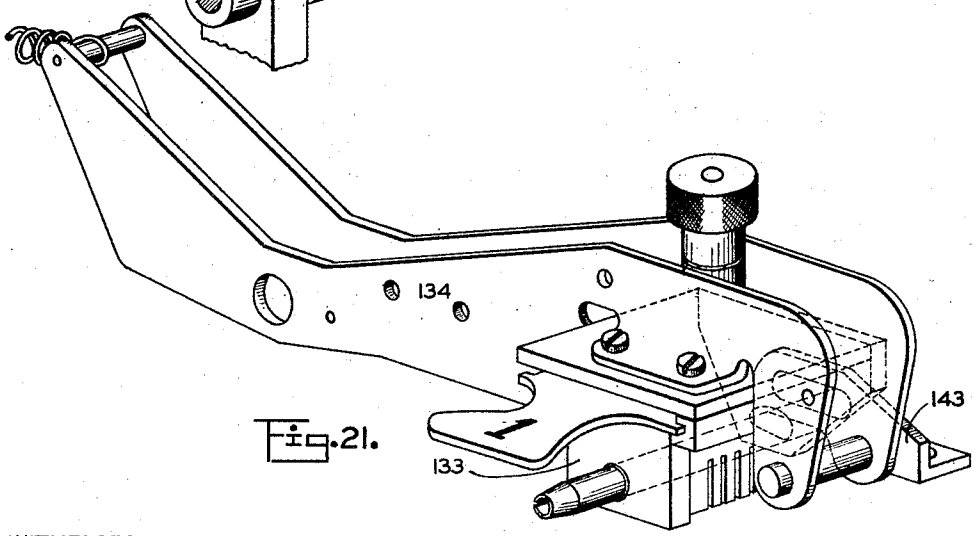


Fig. 21.

WITNESSES

H. D. Hinelin

Donor Rourke

Inventor

William W. Lasker

by

Clarence A. Wilkinson

Attorney

Feb. 15, 1938. W. W. LASKER 2,108,681

CONVERTING AND TRANSLATING PUNCH

Filed July 18, 1933 38 Sheets-Sheet 17

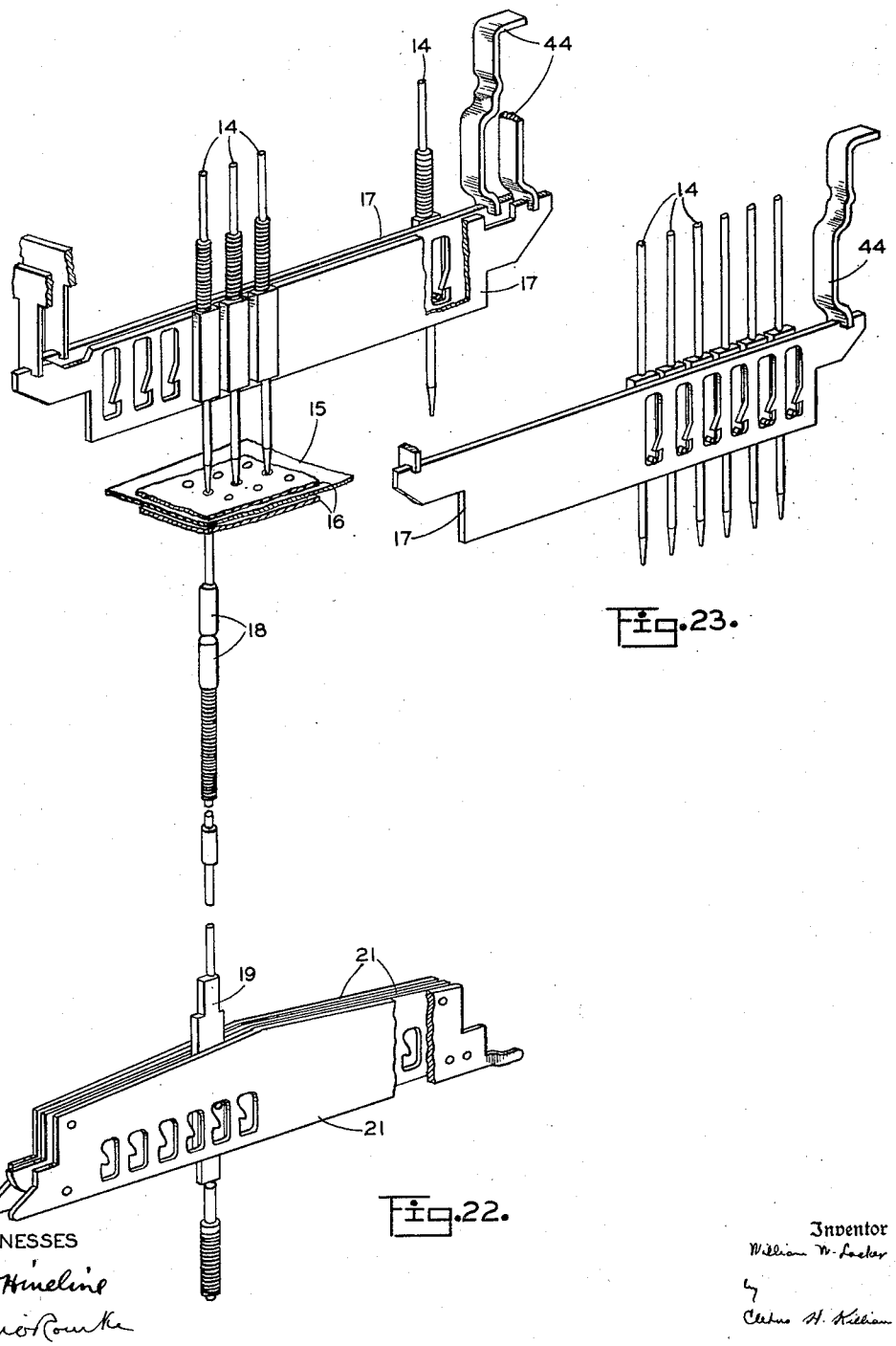


Fig. 23.

Fig. 22.

WITNESSES

H. D. Hineline

Inventor

William W. Lasker

by

Clarence A. Killian

Attorney

Feb. 15, 1938. W. W. LASKER 2,108,681

CONVERTING AND TRANSLATING PUNCH

Filed July 18, 1933 38 Sheets-Sheet 18

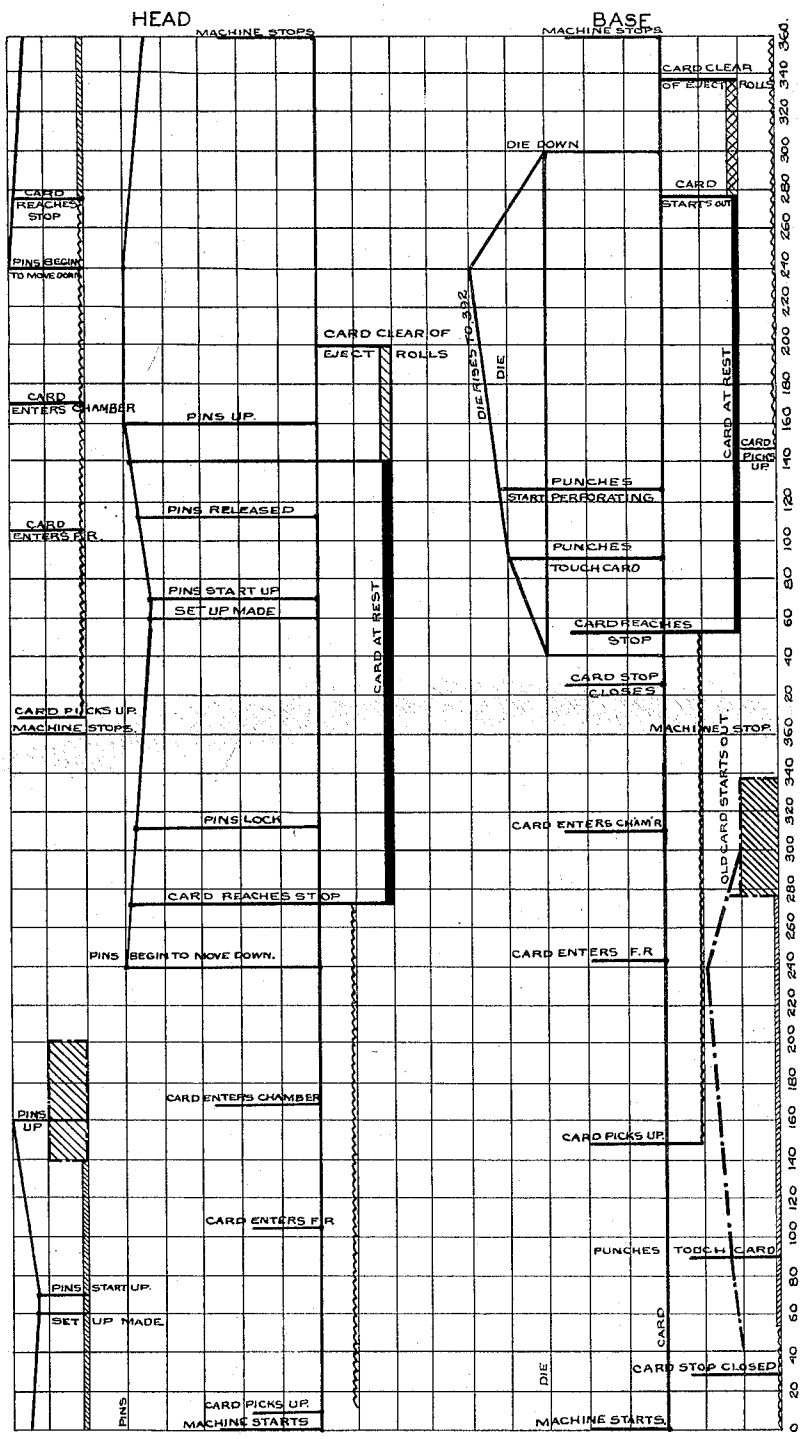


Fig. 24.

Inventor
William W. Lasker
by
Clarence A. Wilkinson
Attorney

Feb. 15, 1938. W. W. LASKER 2,108,681

CONVERTING AND TRANSLATING PUNCH

Filed July 18, 1933 38 Sheets-Sheet 19

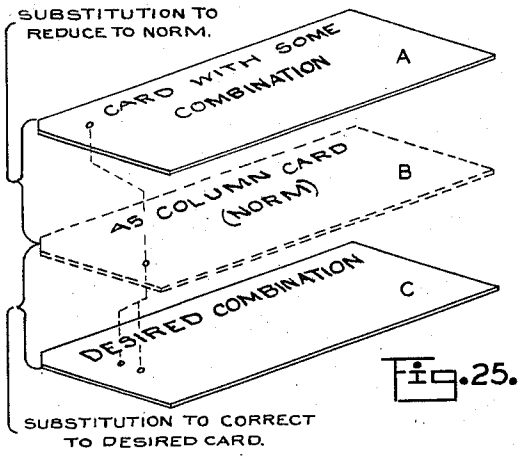


Fig. 25.

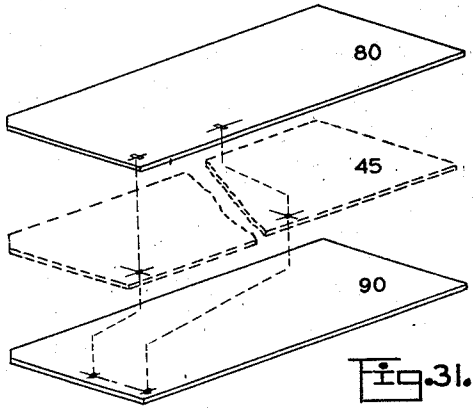


Fig. 31.

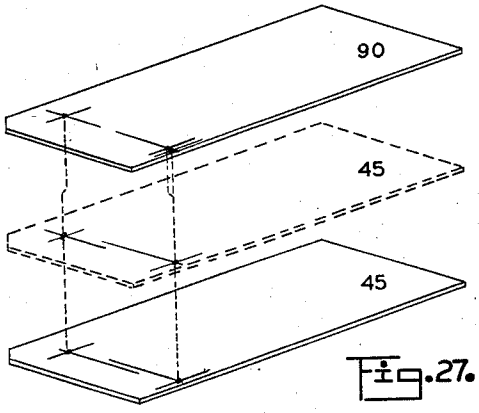


Fig. 27.

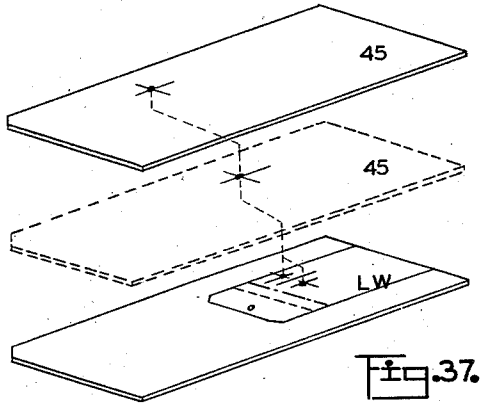


Fig. 37.

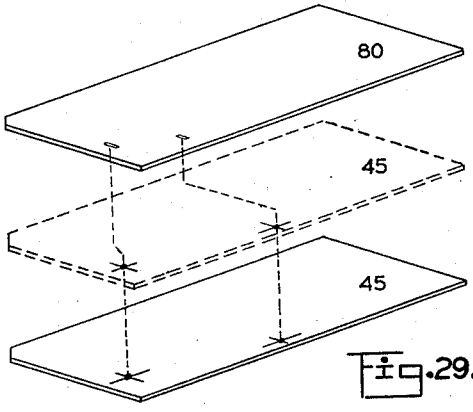


Fig. 29.

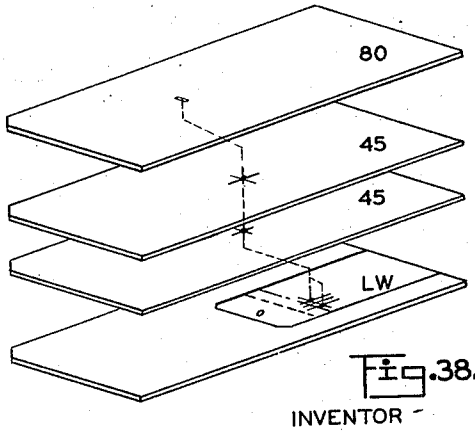


Fig. 38.

WITNESSES

H. D. Hinckley

Donald Rourke

INVENTOR

William W. Lasker

by

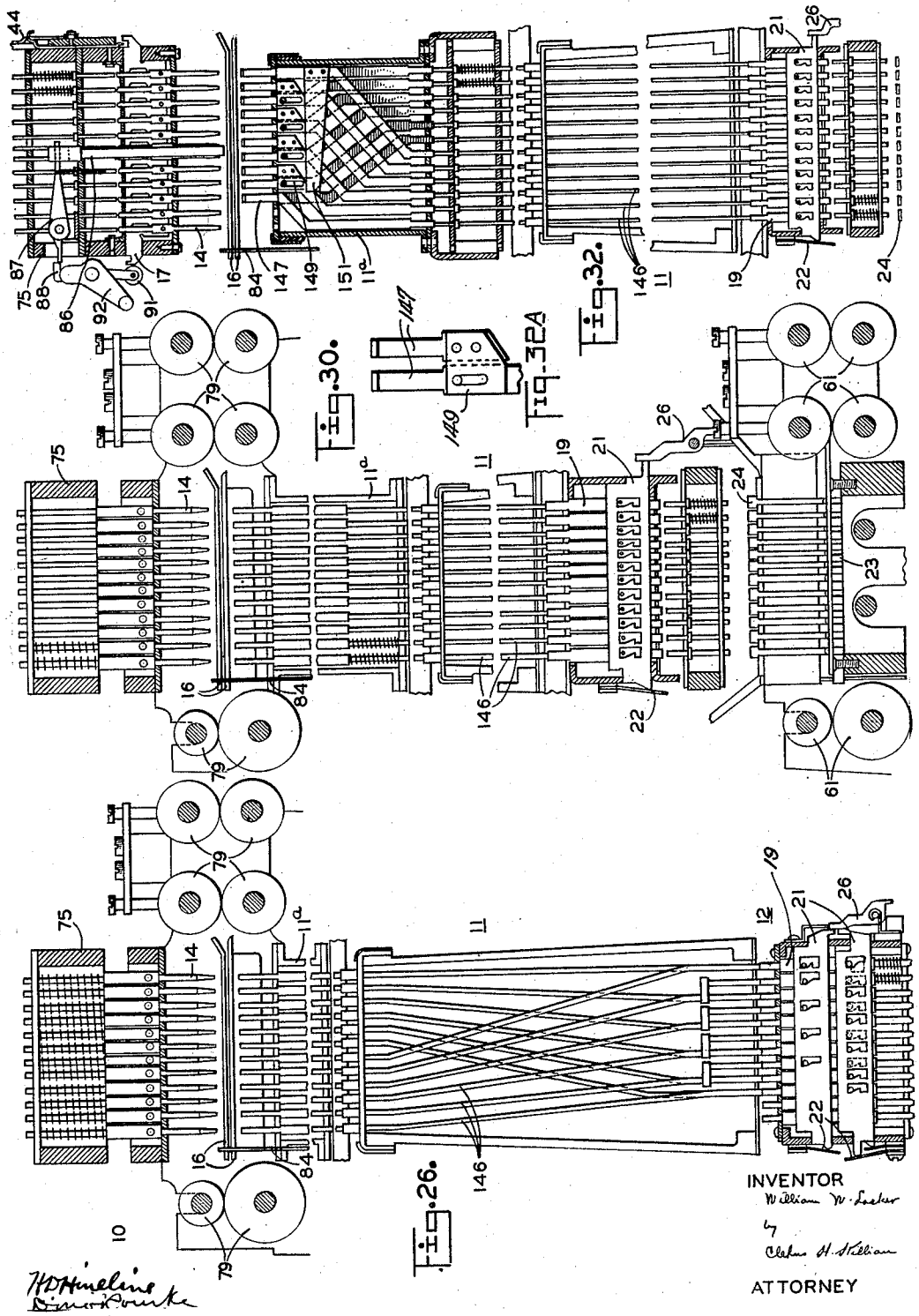
Clarence A. Wilson

ATTORNEY

Feb. 15, 1938. W. W. LASKER 2,108,681

CONVERTING AND TRANSLATING PUNCH

Filed July 18, 1933 38 Sheets-Sheet 20



INVENTOR
William W. Lasker
by
Clarence A. O'Brien
ATTORNEY

H. O'Hineline
Dinsmore & Burke

Feb. 15, 1938. W. W. LASKER 2,108,681

CONVERTING AND TRANSLATING PUNCH

Filed July 18, 1933 38 Sheets-Sheet 21

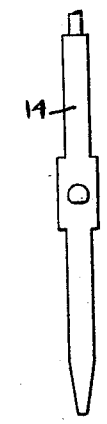


Fig 28

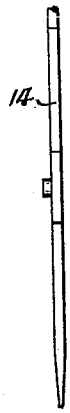


Fig 28B

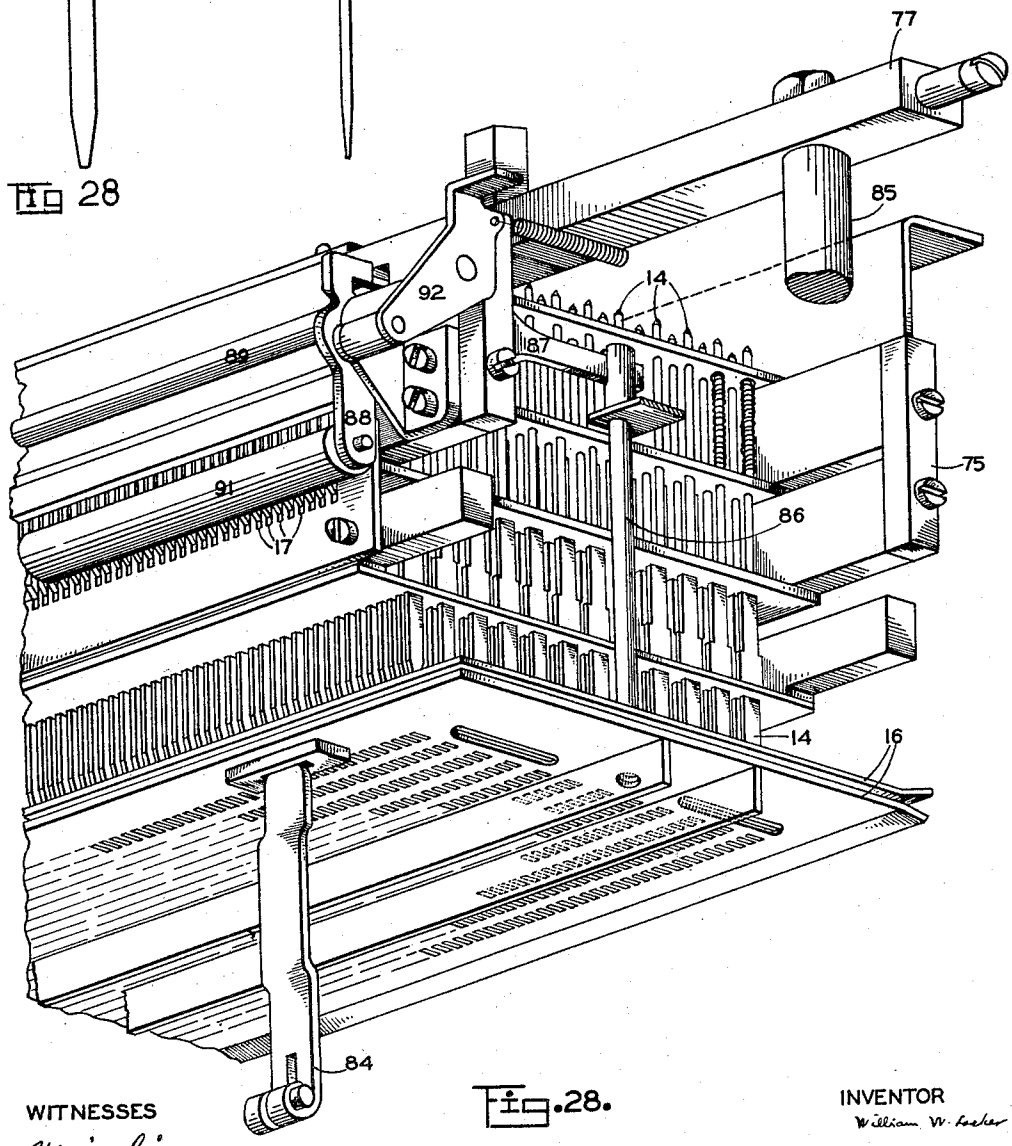


Fig. 28.

WITNESSES

H. D. Hinckley

D. M. O'Rourke

INVENTOR

William W. Lasker

by Clarence A. O'Brien

ATTORNEY

Feb. 15, 1938. W. W. LASKER 2,108,681

CONVERTING AND TRANSLATING PUNCH

Filed July 18, 1933 38 Sheets-Sheet 22

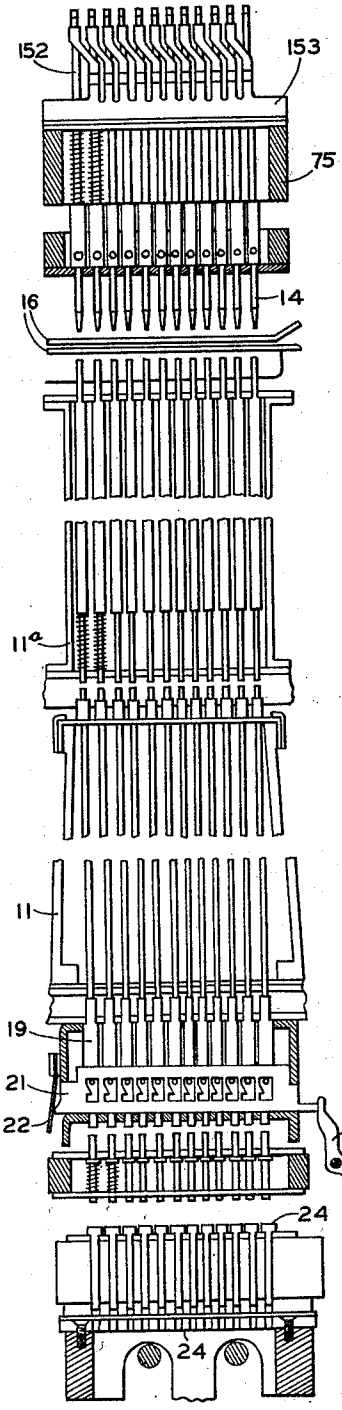


Fig. 33.

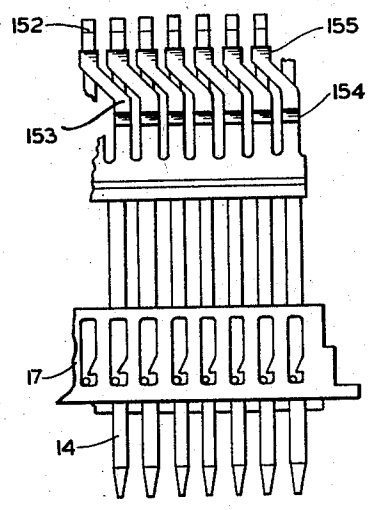


Fig. 34.

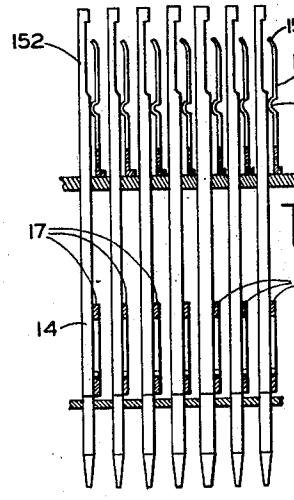


Fig. 35.

INVENTOR
William W. Lasker
by
Clarence A. Wilkinson
ATTORNEY

Feb. 15, 1938. W. W. LASKER 2,108,681

CONVERTING AND TRANSLATING PUNCH

Filed July 18, 1933 38 Sheets-Sheet 23

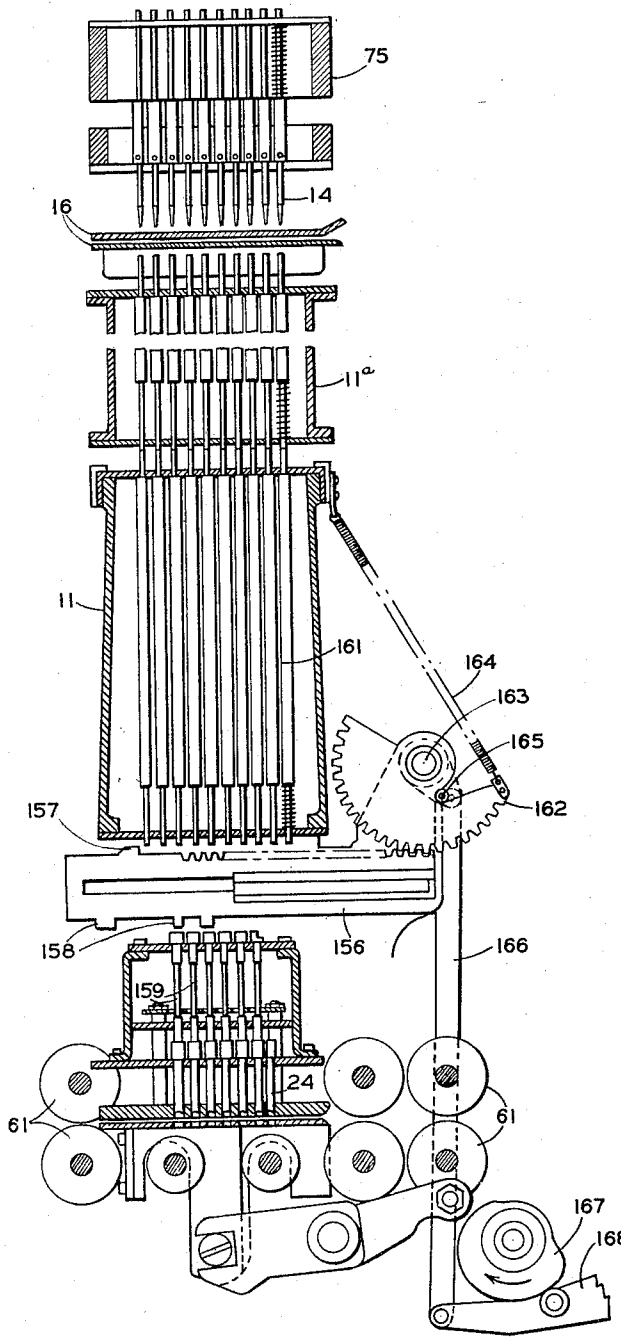


Fig. 36.

WITNESSES

H. D. Hinelines

Dorothy Rourke

INVENTOR

William W. Lasker

by

Clarence H. Killian

ATTORNEY

Feb. 15, 1938. W. W. LASKER 2,108,681

CONVERTING AND TRANSLATING PUNCH

Filed July 18, 1933 38 Sheets-Sheet 24

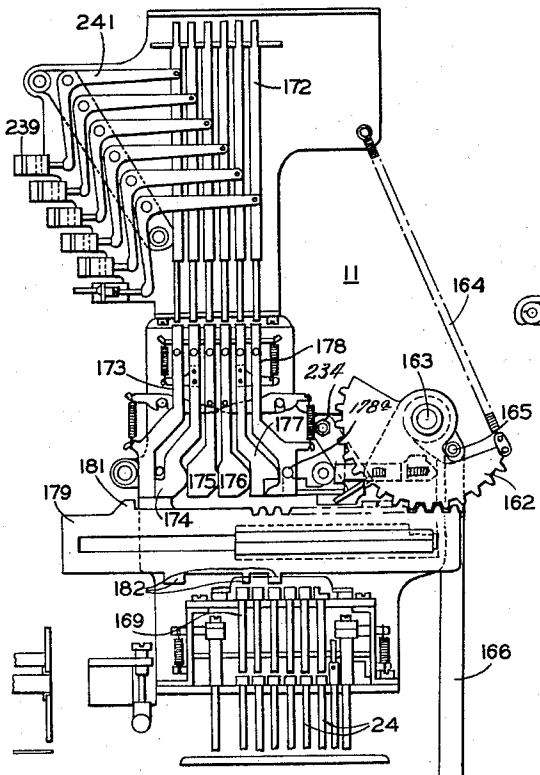


Fig. 40.

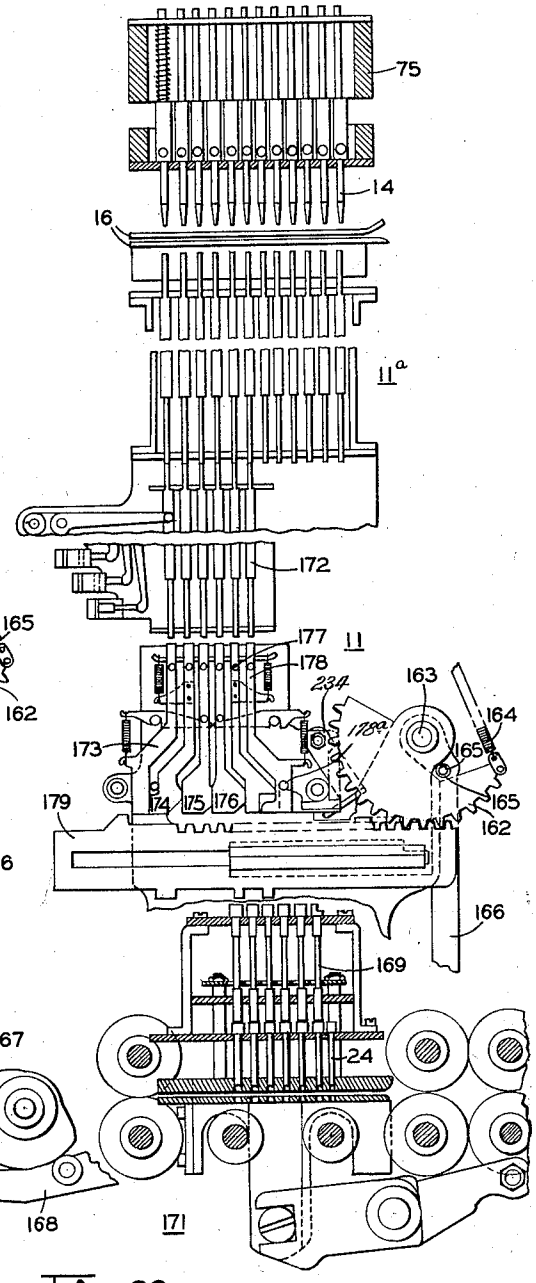


Fig. 39.

WITNESSES

H. P. Hinchline.

D. M. O'Rourke

INVENTOR

William W. Lasker

by Clarence A. Williams

ATTORNEY

Feb. 15, 1938. W. W. LASKER 2,108,681

CONVERTING AND TRANSLATING PUNCH

Filed July 18, 1933 38 Sheets-Sheet 25

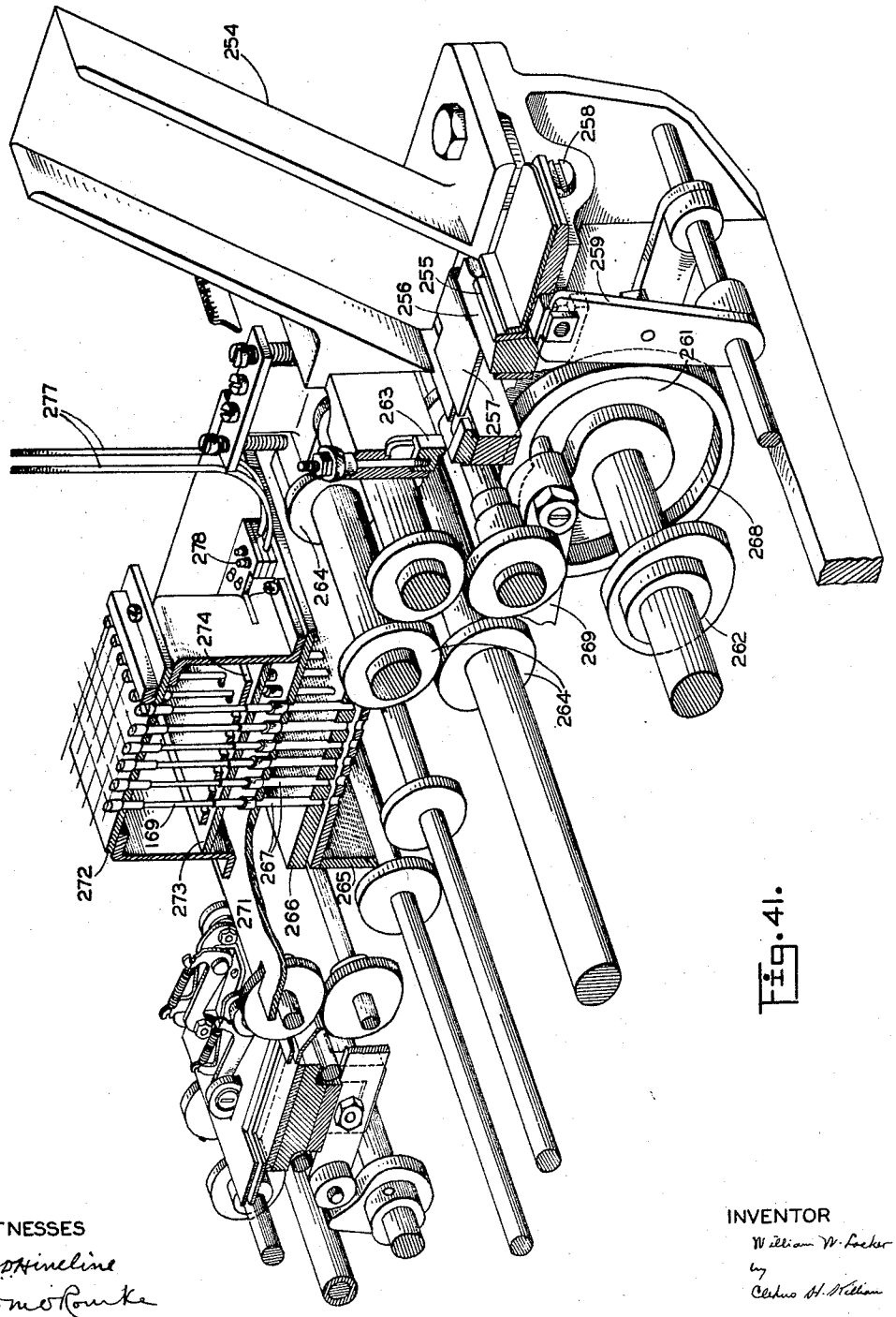


Fig. 41.

WITNESSES

H. D. Hineline

D. M. O'Rourke

INVENTOR

William W. Lasker

by

Clarence A. O'Brien

ATTORNEY

Feb. 15, 1938. W. W. LASKER 2,108,681

CONVERTING AND TRANSLATING PUNCH

Filed July 18, 1933 38 Sheets-Sheet 26

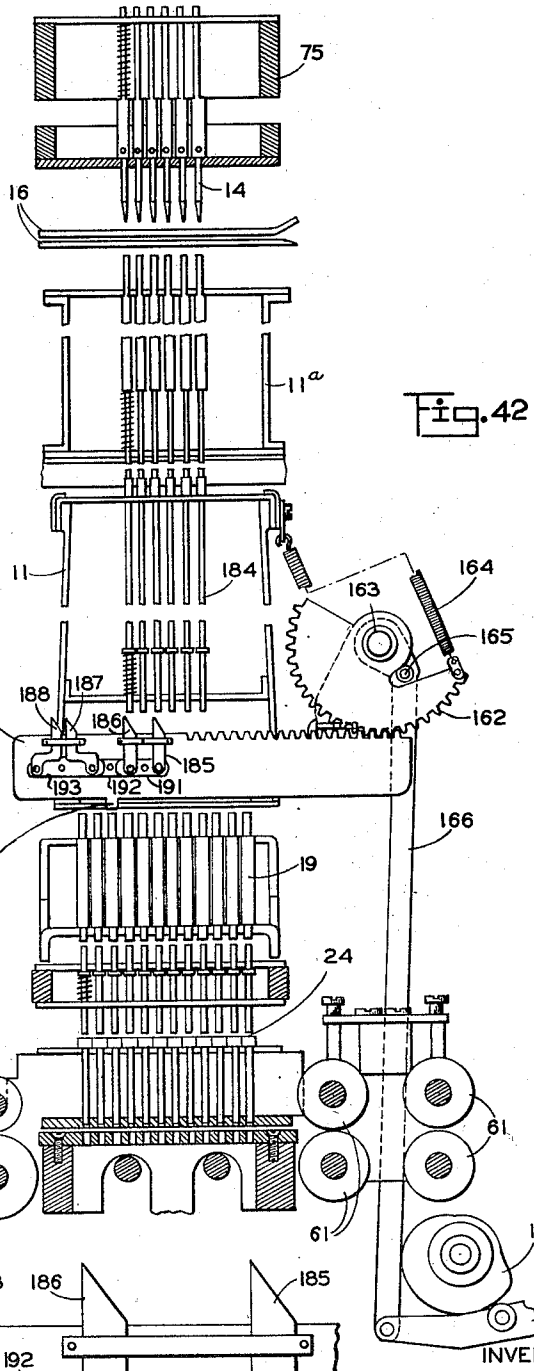


Fig. 42

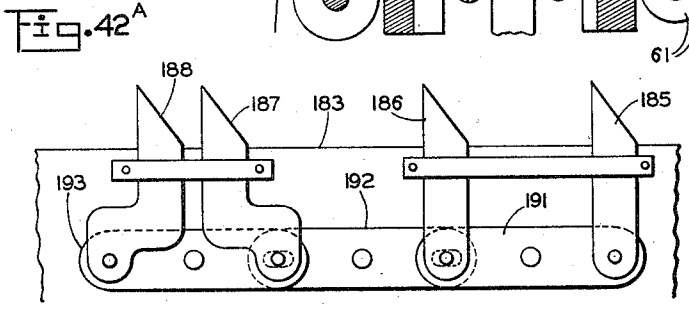


Fig. 42A

INVENTOR

William W. Lasker

by Clarence A. Wilkinson

ATTORNEY

Feb. 15, 1938. W. W. LASKER 2,108,681

CONVERTING AND TRANSLATING PUNCH

Filed July 18, 1933 38 Sheets-Sheet 27

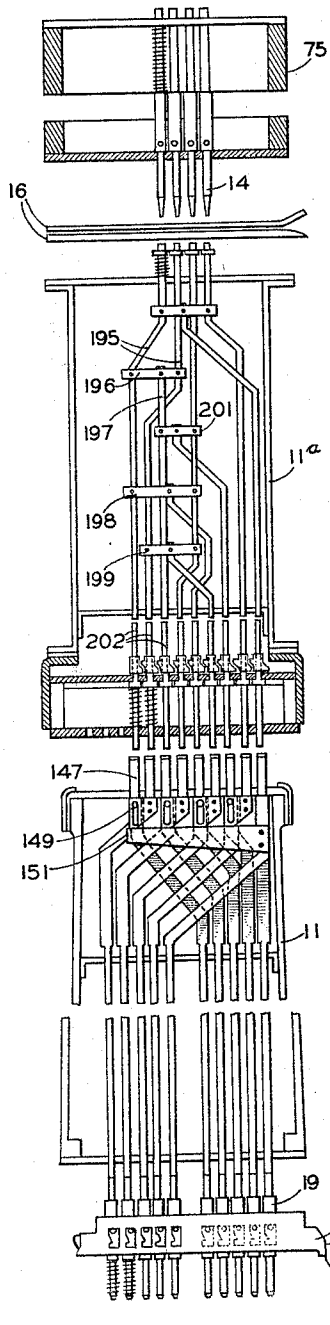


Fig. 44

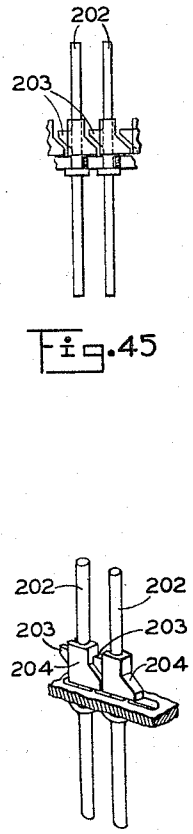


Fig. 45

Fig. 46

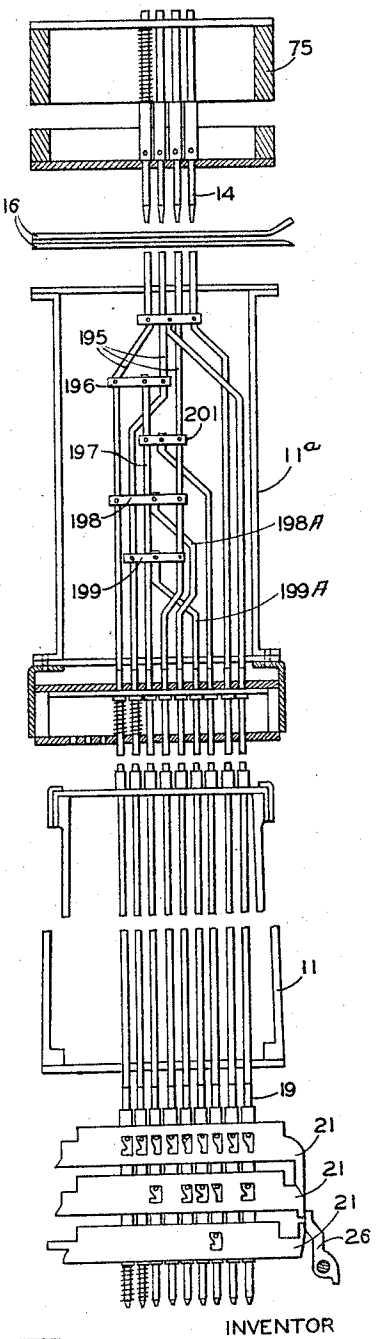


Fig. 43

WITNESSES

H. D. Hineline

Emil Rourke

INVENTOR

William W. Lasker

by Clarence A. O'Brien

ATTORNEY

Feb. 15, 1938. W. W. LASKER 2,108,681

CONVERTING AND TRANSLATING PUNCH

Filed July 18, 1933 38 Sheets-Sheet 28

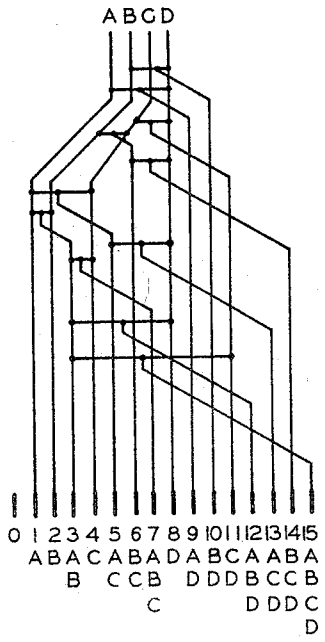


Fig. 47

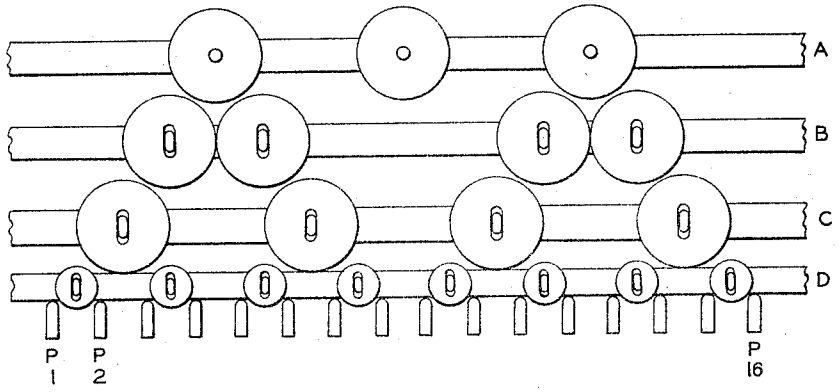


Fig. 48

WITNESSES

H. H. Hinckley

Dorothy Rourke

INVENTOR

William W. Lasker

by Cedric A. Gilliam

ATTORNEY

Feb. 15, 1938. W. W. LASKER 2,108,681

CONVERTING AND TRANSLATING PUNCH

Filed July 18, 1933 38 Sheets-Sheet 29

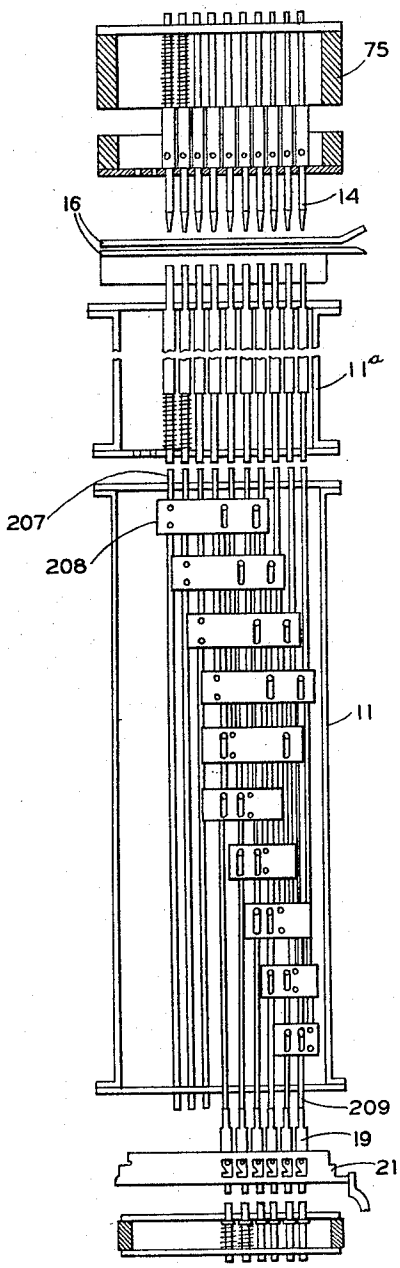


Fig. 50

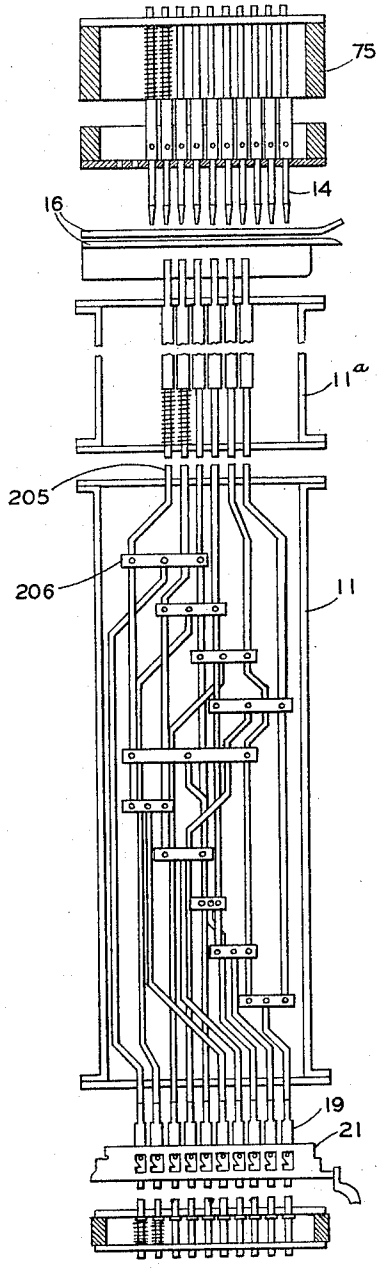


Fig. 49

WITNESSES

H. P. Hinelina.

D. M. O'Rourke

INVENTOR

William W. Lasker

by Clarence H. Killam

ATTORNEY

Feb. 15, 1938. W. W. LASKER 2,108,681

CONVERTING AND TRANSLATING PUNCH

Filed July 18, 1933 38 Sheets-Sheet 30

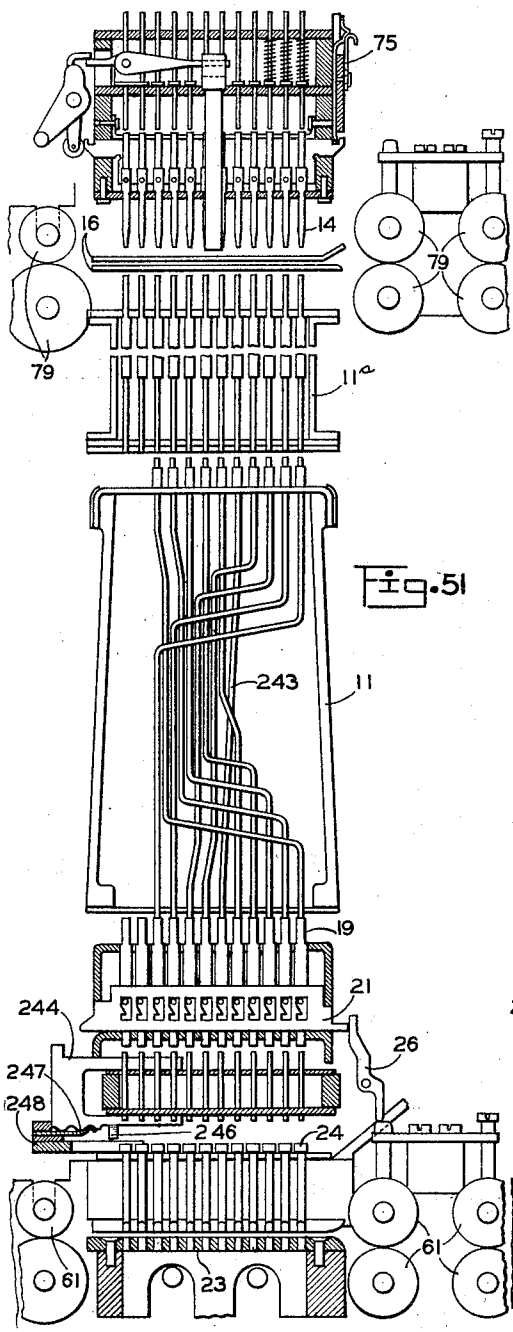


Fig. 51

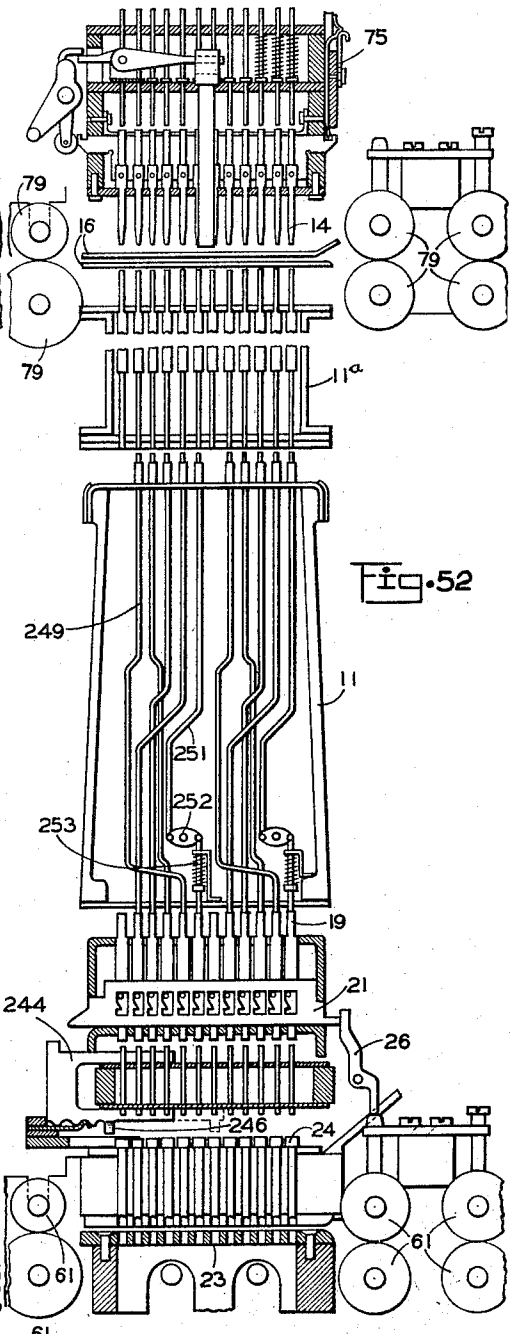


Fig. 52

WITNESSES

H. D. Kineline

Dan O'Rourke

INVENTOR

William W. Lasker

by Clarence A. Hilliam

ATTORNEY

Feb. 15, 1938. W. W. LASKER 2,108,681

CONVERTING AND TRANSLATING PUNCH

Filed July 18, 1933 38 Sheets-Sheet 31

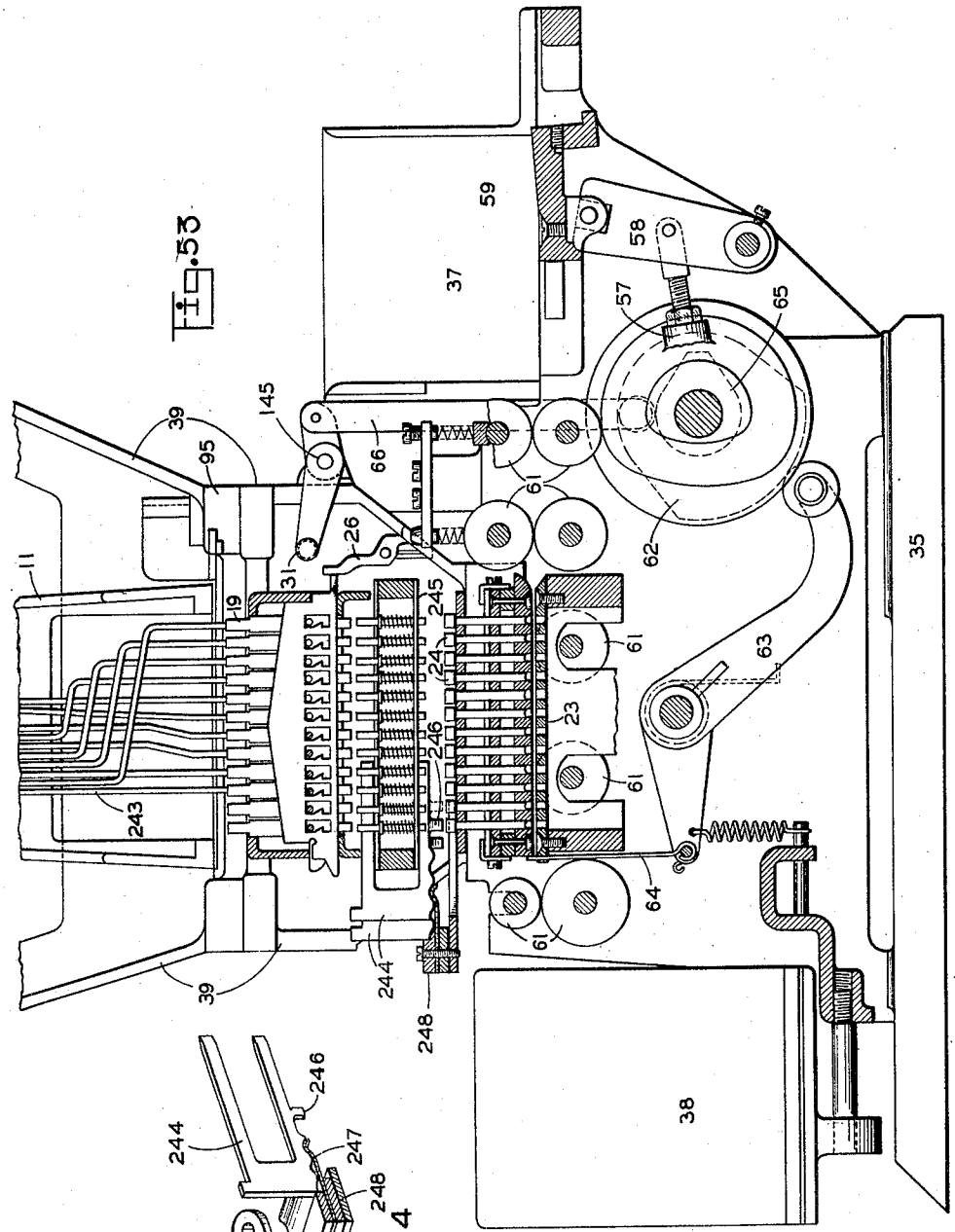


FIG. 53

FIG. 54

WITNESSES

H. D. Hinsline

INVENTOR

William W. Lasker

by Charles A. Wilkinson

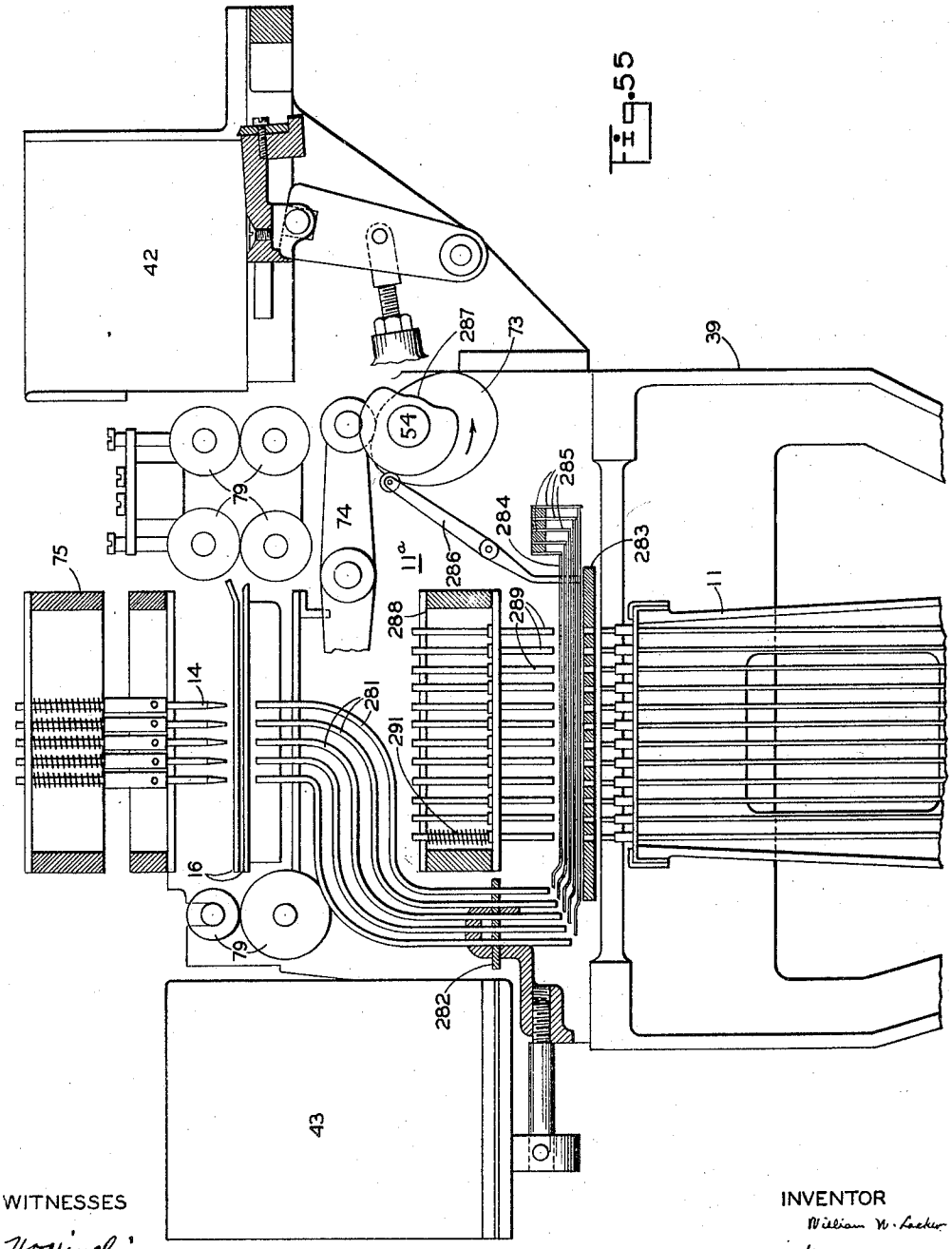
ATTORNEY

Feb. 15, 1938. W. W. LASKER 2,108,681

CONVERTING AND TRANSLATING PUNCH

Filed July 18, 1933 38 Sheets-Sheet 32

Fig. 55



WITNESSES

H. D. Hinckley

D. M. O'Rourke

INVENTOR

William W. Lasker

by

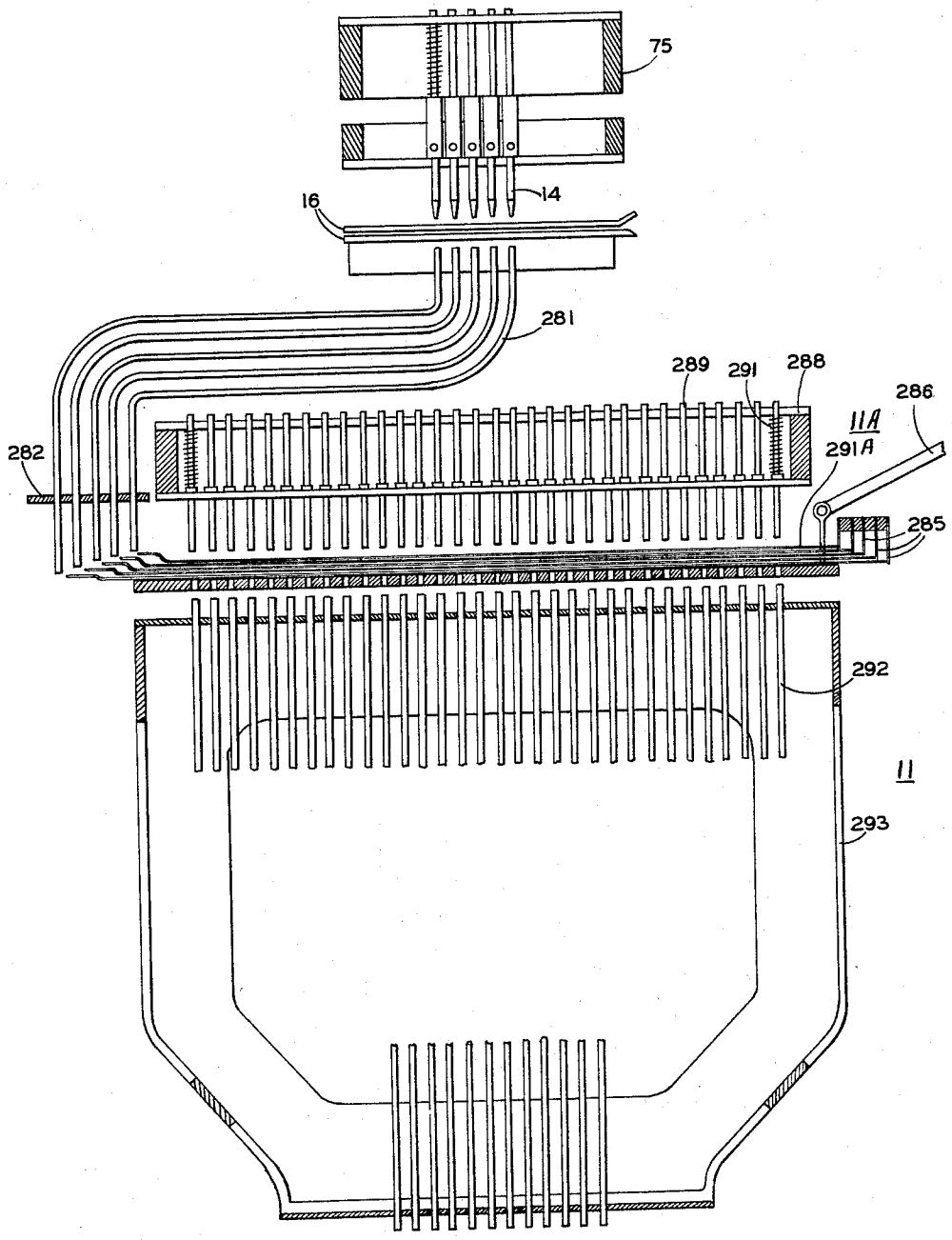
Clarence A. Wilkinson

ATTORNEY

Feb. 15, 1938. W. W. LASKER 2,108,681

CONVERTING AND TRANSLATING PUNCH

Filed July 18, 1933 38 Sheets-Sheet 33



WITNESSES

H. O. Hineline

D. M. O'Rourke

Fig. 56

INVENTOR

William W. Lasker

by Cedric H. Kilian

ATTORNEY

Feb. 15, 1938. W. W. LASKER 2,108,681

CONVERTING AND TRANSLATING PUNCH

Filed July 18, 1933 38 Sheets-Sheet 34

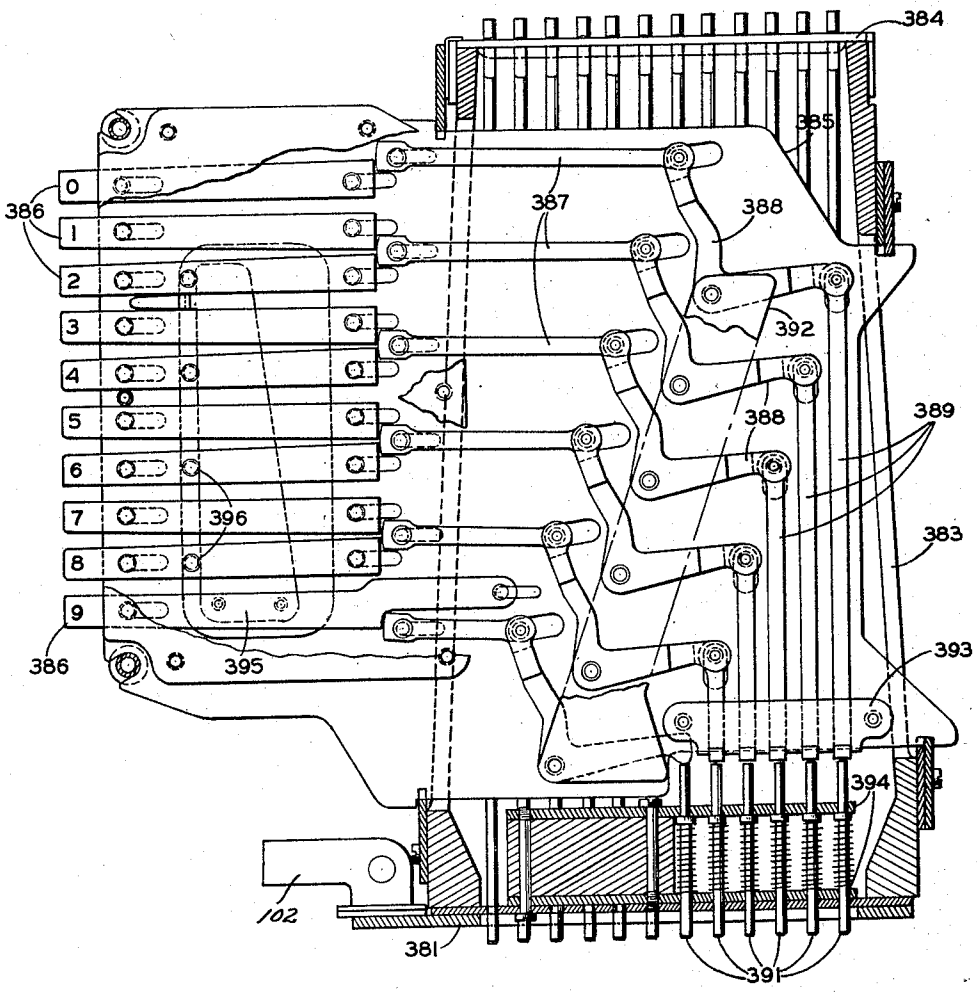


Fig. 57

WITNESSES

H. D. Hinckley

D. M. O'Rourke

INVENTOR

William W. Lasker

by Clarence A. O'Brien

ATTORNEY

Feb. 15, 1938. W. W. LASKER 2,108,681

CONVERTING AND TRANSLATING PUNCH

Filed July 18, 1933 38 Sheets-Sheet 35

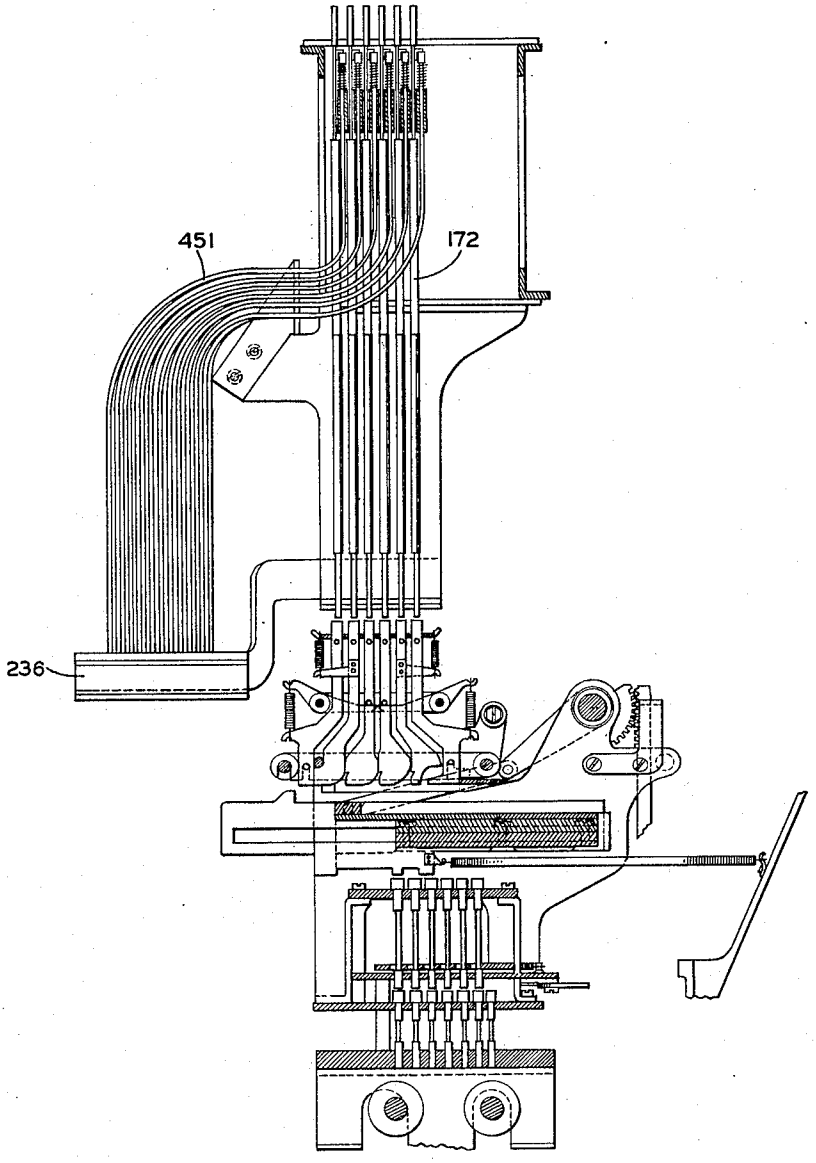


Fig. 58

WITNESSES

H. D. Hineline

D. M. O'Rourke

INVENTOR

William W. Lasker

by

Clarence A. Wilkinson

ATTORNEY

Feb. 15, 1938. W. W. LASKER 2,108,681

CONVERTING AND TRANSLATING PUNCH

Filed July 18, 1933 38 Sheets-Sheet 36

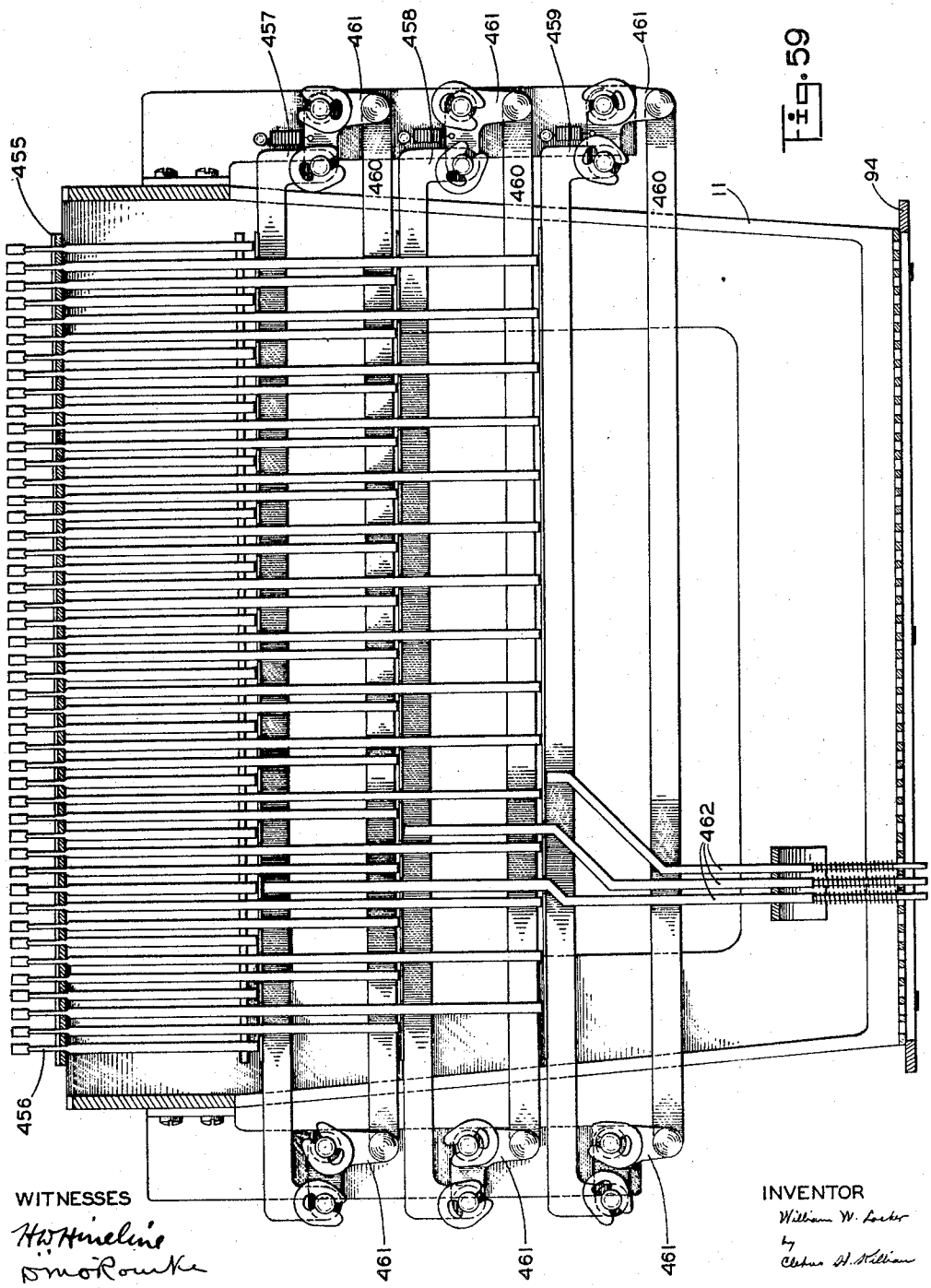


Fig. 59

WITNESSES

H. W. Hineline

D. M. O'Rourke

INVENTOR

William W. Lasker

by Clarence A. Willian

ATTORNEY

Feb. 15, 1938. W. W. LASKER 2,108,681

CONVERTING AND TRANSLATING PUNCH

Filed July 18, 1933 38 Sheets-Sheet 37

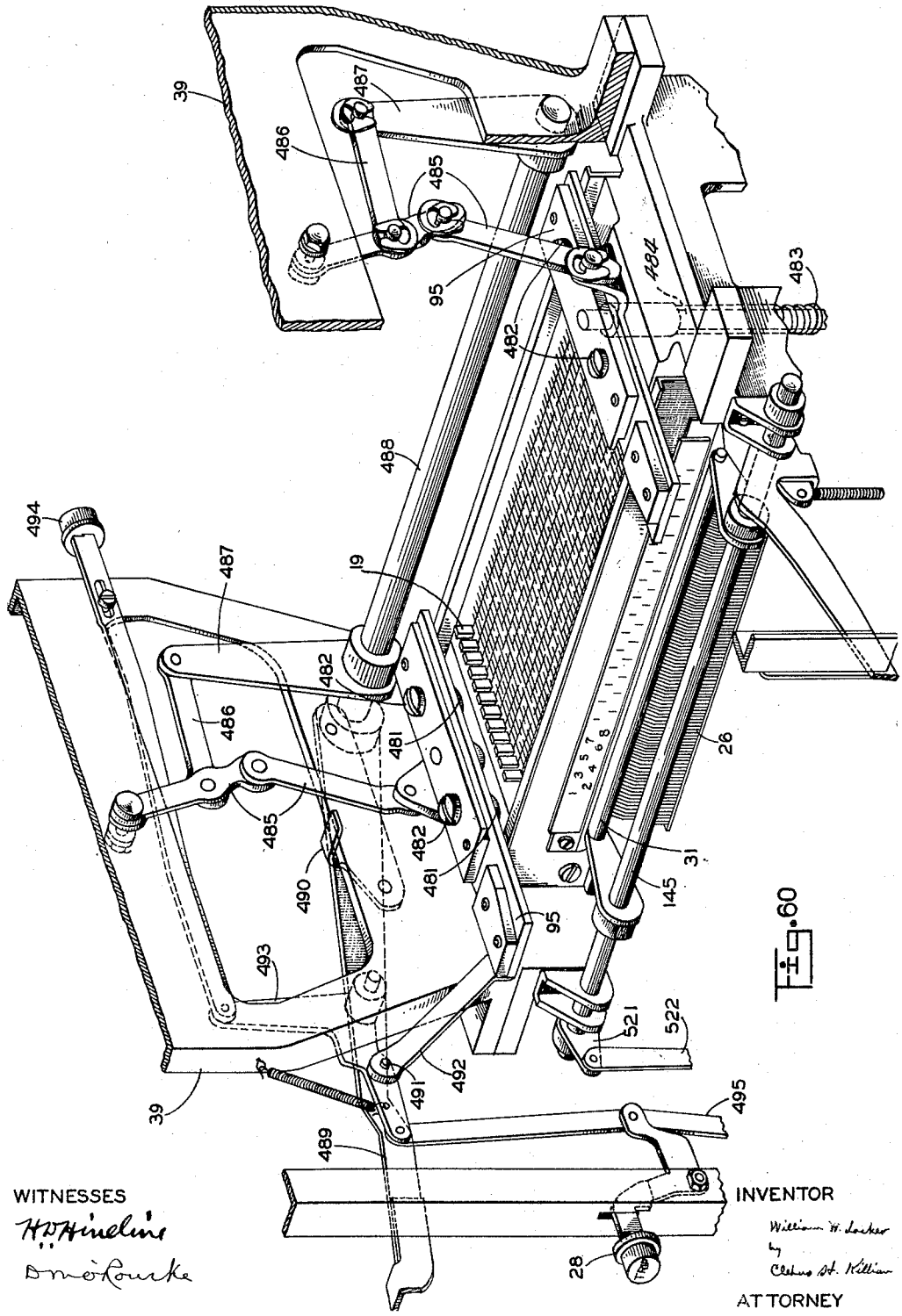


Fig. 60

WITNESSES

H. D. Hineline

D. M. O'Rourke

INVENTOR

William W. Lasker

by

Clarence A. Killian

ATTORNEY

Feb. 15, 1938. W. W. LASKER 2,108,681

CONVERTING AND TRANSLATING PUNCH

Filed July 18, 1933 38 Sheets-Sheet 38

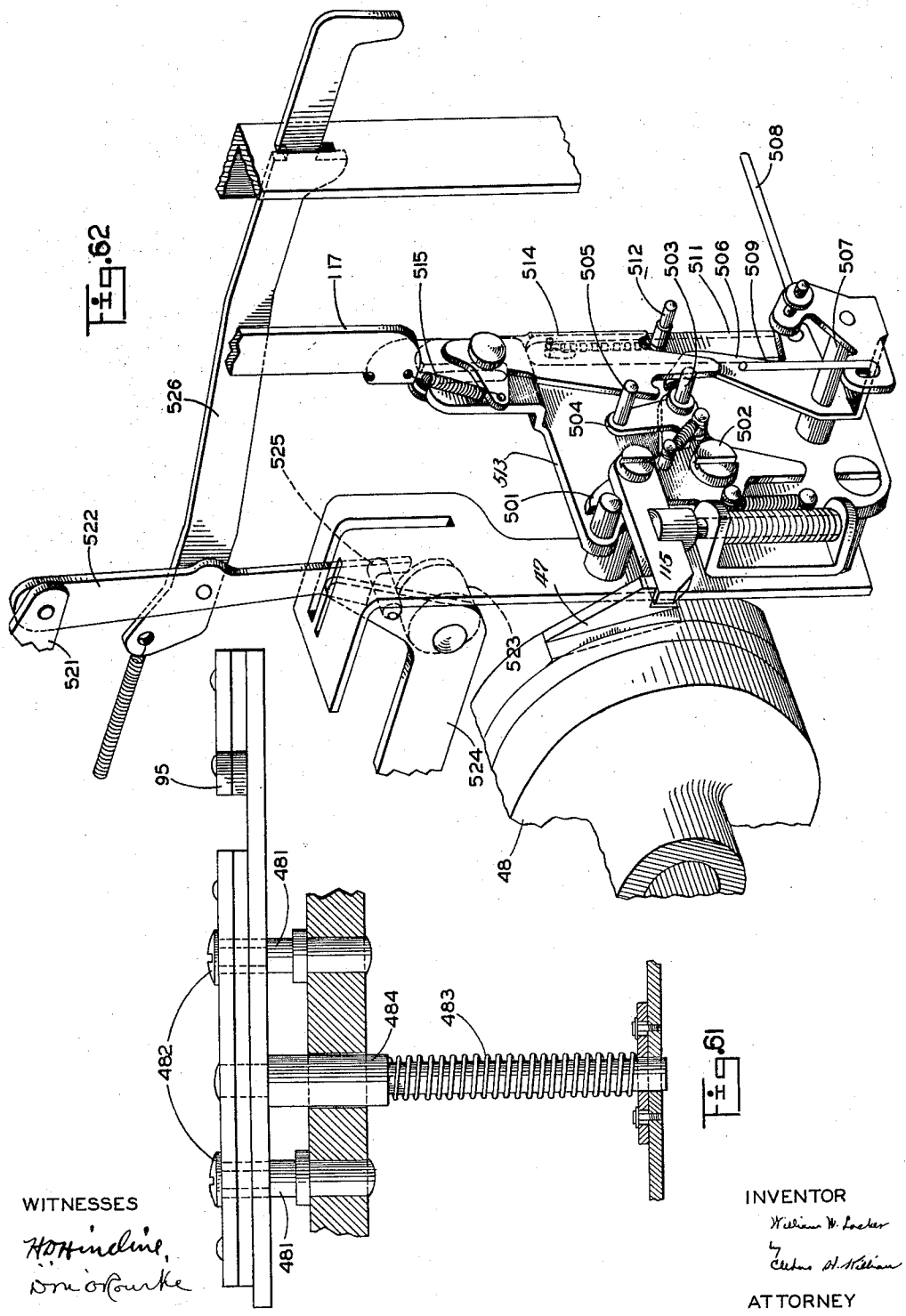


Fig. 62

Fig. 61

WITNESSES

H. D. Hinckley,

D. M. O'Rourke

INVENTOR

William W. Lasker

by Clarence A. Wilson

ATTORNEY

Patented Feb. 15, 1938 2,108,681

UNITED STATES PATENT OFFICE

2,108,681

CONVERTING AND TRANSLATING PUNCH

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

Application July 18, 1933, Serial No. 680,922

20 Claims. (Cl. 164—114)

The present invention relates generally to translating punches, and particularly to a translating punch adapted to produce cards perforated according to a desired code from cards perforated according to another code.

In the tabulator art, a number of types of tabulators have been developed, but each type of tabulator can be used only with cards perforated according to a particular code. Thus, there are as many codes for recording data on punched cards as there are types of tabulators. The use of these various codes has seriously limited the utility of any one type of tabulator, especially when the tabulator user changes from one type of tabulator to another. In this case, he has one set of cards perforated according to the code usable in the new tabulator and another set perforated according to a different code usable only with the tabulator formerly in his possession. Similarly, other tabulator users may be in the same position.

It is, therefore, evident that a large number of tabulator users may collectively have cards perforated according to all the various existing codes, although any given tabulator user may have only two sets of cards in his possession, one set perforated according to a code that can be used with his tabulator and another set perforated according to a code that cannot be so used.

If, in this situation, any tabulator user of this group desires a report taken from both of the sets of cards in his possession, it is evident that he cannot obtain it with a tabulator operable only on cards perforated according to a single code. It is thus desirable to provide a tabulating punch capable of producing one set of cards perforated according to any desired code from other cards perforated according to another code. Such a machine may be supplied to any tabulator user to enable him to convert all of the cards in his possession into cards that can be used with his particular type of tabulator.

The translating punch of the present invention is designed to perform the function just mentioned. It is provided with interchangeable translator units by means of which the machine can be conditioned to translate data from cards perforated according to any given code into any desired code, and then punch this data or modifications of this data in other cards. The proper translator units are inserted at the factory and then the translating punch is supplied to each tabulator user long enough to enable him to convert all of the cards in his possession into other cards that can be used in his particular type of tabulator. When all of the cards in his possession are thus converted, he is able to supply a report covering all of his cards. Thereafter, the translating punch can be used successively for the same purpose by the remaining tabulator users of the group.

In the process of obtaining cards perforated according to a desired code from a card or cards perforated according to another and different code, it is often necessary to translate this given code into either a single intermediate code or a number of intermediate codes before obtaining the desired code. The translation from one code to another code, whether from the given or initial code to an intermediate code, from one intermediate code to another, or from an intermediate code to the desired or end code, may be termed a "substitution". Hence, in the process of obtaining cards perforated according to a desired or end code from a card or cards perforated according to a given or initial code, it may be necessary to carry out a single substitution or a series of substitutions. These substitutions are carried out by a plurality of translator units interposed between the sensing basket and the punch gags of the translating punch. A number of such translator baskets are used, and they are adapted to be interchangeably associated with the translating punch. The particular set of two translator baskets associated with the punch at any given time is dependent upon the initial or given code and the end or desired code.

The machine of the present invention is an extension of, and an improvement over, the machine disclosed in my co-pending application S. N. 616,926, filed June 13, 1932, now Patent No. 2,004,208, granted June 11, 1935, and may be used for all of the operations, which may be performed by that machine, as well as a variety of other operations beyond the capacity of that machine, including such operations as copying code cards and simultaneously translating data from one code to another; modifying the data by the inclusion of additional desired perforations or the omission of undesired perforations, or groups of perforations, or any desired change in the relative positions of the perforation fields, making negative, reverse, or complementary cards, either in the same code or during the translation from code to code, and duplicating a single field of perforations from one card in two or more places, or in two or more forms, in another card.

It is the principal object of the present invention automatically to translate punching designations from an initial code to a norm or stand-

ard code and from this code to a desired end code.

It is a further object to provide a translating punch capable of sensing cards carrying data in an initial card and of producing other cards carrying the same data or modified data in a desired end code, with the position of the data on the newly produced card in the same position or in a different position on said card than the original data as originally copied on the sensed card.

It is another object to enable cards perforated according to any one of a number of end codes to be automatically obtained from cards perforated according to any one of a number of initial codes.

It is another object to carry out successive substitutions until data recorded on one card in an initial code is recorded on another card in a desired end code.

It is a further object to carry out one or more substitutions until data recorded on a card in an initial code is translated into a norm or standard code, and then, if necessary, to continue the substitutions until the data is automatically recorded on another card in a desired end code.

It is another object to carry out the successive substitutions by means of a set of aligned and detachable translator baskets.

It is an additional object to employ the well known 45-code as the norm or standard code.

It is another object to enable data recorded on one card in an initial code to be automatically recorded on another card in an end code and the data recorded on the latter card in a modified form.

It is a further object to enable data recorded on one card in an initial code to be converted into complementary data and the complementary data automatically recorded on another card in the same code as the code of the original card.

It is another object to enable data recorded on one card in a forty-five column code to be automatically converted into complementary data in the same code and the complementary data recorded on another card.

It is a further object to enable data recorded on one card in a ninety column code to be automatically converted into complementary data in the same code and the complementary data recorded on another card.

It is a further object to enable data recorded on one card in one code to be automatically converted into complementary data in the same code, the complementary data recorded in a different position on another card than the original data occupied on the first card.

It is an additional object to enable data recorded on one card in an initial code to be automatically recorded on another card in an end code, with the data on the latter card occupying a different position than the data occupied on the first mentioned card.

Although the system of translating from an initial to an end code has been described herein in connection with a translating punch, it is to be understood that the sets of detachable translator baskets, which effect this translation, can be readily adapted for use with other machines, with a tabulator, for example, as will be readily understood when the following description and the appended claims are considered in connection with the accompanying drawings, wherein:

Fig. 1 is a view in front elevation of the improved translating perforator of this invention.

Fig. 2 is a view in perspective of the interior members of the device of the invention with the translating interponents removed.

Fig. 3 is a skeleton view, in perspective, of essential elements of the device of the invention.

Fig. 4 is a detail view, in side elevation, of the retract members of Fig. 3, suitable for releasing the gag members.

Fig. 5 is a side view, in section, through approximately the middle part of the top portion of the improved punch, showing an auxiliary interpreter basket and also the upper portion of the intermediate interpreter members.

Fig. 6 is a side view, in section, through approximately the middle portion of the base member of the improved translating punch, showing also the lower portion of the intermediate interpreter members.

Fig. 7 is a view, in section, of the front elevation of the head member of the improved translating punch.

Fig. 8 is a similar view, in section, of the front elevation of the base member of the punch.

Fig. 9 is a view, in perspective, of the head member of the punch, showing the feeler pin members and card handling members.

Fig. 10 is a view, in perspective, of the guiding and operating mechanism of the sensing member of the punch head.

Fig. 11 is a similar view, in perspective, of the members of the other side of the head mechanism from that shown in Fig. 10.

Fig. 12 is a perspective view of a typical interpreter or translator basket adapted to utilization in the device of this invention.

Fig. 13 is a fragmentary view in perspective of the top of the base portion of the punch members, and the support mechanism for the translator basket members.

Fig. 14 is a detail view of a latch member for the interpreter basket.

Fig. 15 is a fragmentary view in perspective of an automatic card numbering mechanism adapted to be included in the construction of the punch.

Fig. 16 is a detail view in perspective of the control member for disabling or enabling the card sensing means in the supply magazines.

Fig. 17 is a front view partly in section of the card presence sensing mechanism, driving clutch member and automatic stop device.

Fig. 18 is a view of the clutch member in release position.

Fig. 19 is a front view in perspective of the counter mechanism, and clutch release members.

Fig. 20 is a view in perspective of the retract control mechanism.

Fig. 21 is a view in perspective of the numbering head mechanism.

Fig. 22 is a fragmentary view in perspective of the operating elements of the machine adapted to alternative disablement of the respective fields of sensing pins for a 90 column field code card.

Fig. 23 is a similar view of an alternative pin and latch member.

Fig. 24 is a timing diagram, showing the sequence of operation of the punch members.

Fig. 25 is a diagrammatic representation of a series of substitutions according to this invention.

Fig. 26 is a fragmentary sectional view of the sensing head, interpreter wires, translator members, and gag members of the invention, arranged to translate data from cards perforated according to the 90 column code to produce cards having the same data indicated by perforations according to the normal or 45 column code.

Fig. 27 is a diagrammatic representation of the substitution required for the translation from 90 column to 45 column codes.

Fig. 28 is a perspective view of a sensing head adapted to cooperate with 80 column cards having rectangular perforations.

Fig. 28*a* is a front view of the sensing pins of the 80 column sensing head of Fig. 28.

Fig. 28*b* is a side view of the sensing pins of the 80 column sensing of Fig. 28.

Fig. 29 is a diagrammatic representation of a series of substitutions for translating from 80 column code to 45 column code.

Fig. 30 is a section in vertical elevation of a sensing head, interpreter member, and punch member, for converting from 80 column code to 45 column code.

Fig. 31 is a diagrammatic representation of a series of substitutions for translating from 80 column code to 90 column code.

Fig. 32 is a sectional view in vertical elevation of a sensing head, interpreter members, translator members, and punch gag members for converting from 81 column code to 90 column code.

Fig. 32*a* is a detailed view showing the relation of two adjacent interpreter translator members and the associated flag from the basket 11*a* of Fig. 32.

Fig. 33 is a side view in section of the sensing head, interpreter and translator wires and punch member, showing the members arranged for translating from Tauschek code to 45 column or normal code.

Fig. 34 is a side view on a larger scale of the sensing pins of Fig. 33.

Fig. 35 is an end view of the sensing pin and spring members shown in Fig. 33.

Fig. 36 is a front view, in section, of the sensing pins, interponent members, translator members and punch gag members of the device arranged for translation from 45 column to Lasker-Woodruff code.

Fig. 37 is a diagrammatic representation of a series of substitutions for translation from 45 column code to Lasker-Woodruff code.

Fig. 38 is a diagrammatic representation of a duplex series of translations from one complex code to another.

Fig. 39 is a fragmentary view in vertical section of the card conveying mechanism, sensing members, translator members and punch, adapted to the translation of code cards perforated according to the 90 column or Lasker code to cards perforated according to the Lasker-Woodruff code.

Fig. 40 is a detail view of the interpreter member for translation from 90 column code to Lasker-Woodruff code.

Fig. 41 is a perspective view, partly in section, of a card supply magazine, picker knife, conveying rolls, punch assembly, and receiving magazine for cards of the Lasker-Woodruff type.

Fig. 42 is a fragmentary view in vertical section of an embodiment for translating from Lasker-Woodruff code to 45 column code.

Fig. 42*a* is an enlarged view of the slide member 183 of Fig. 42, showing in greater detail the swinging stop members.

Fig. 43 is a fragmentary view in vertical section of an embodiment for translating from Borel-Siemens-Halske to 45 column code.

Fig. 44 is a fragmentary view in vertical section of an embodiment for translating from Borel-Siemens-Halske to 90 column code.

Fig. 45 is a detailed view in section of a portion of the device of Fig. 44.

Fig. 46 is a perspective view of the members shown in Fig. 45.

Fig. 47 is a line diagram of the general case for translating from multi-perforation code to normal code by means of floating levers.

Fig. 48 is a diagrammatic view of a general case embodiment for translating from four-unit code to normal code.

Fig. 49 is an alternative embodiment for translating from Lasker-Woodruff code to 45 column code.

Fig. 50 is an alternative embodiment for translating from 45 column to Lasker-Woodruff code.

Fig. 51 is a fragmentary view in vertical elevation of an embodiment for translating from 45 column code to 45 column complementary code.

Fig. 52 is a fragmentary view in vertical section of an embodiment for translating from 90 column to 90 column complementary code.

Fig. 53 is a view in vertical section of a punch member and means for inserting a special perforation.

Fig. 54 is a perspective view of a special perforation inserting member.

Fig. 55 is a view in vertical section of an embodiment adapted to the translation from five-unit alphabetic code to 45 or 90 column alphabetic code.

Fig. 56 is a fragmentary view in vertical section of an embodiment adapted to the conversion of five-unit alphabetic code to a single element code.

Fig. 57 is a side view partly in section of a translator interpreter member having auxiliary manually operable setting members.

Fig. 58 is a side view, partly in section, of a form of connection to a printing interpreter.

Fig. 59 is a front view, in section, of a consolidating interpreter mechanism.

Fig. 60 is a perspective view, partly in section, of the translator member carrying mechanism.

Fig. 61 is a side view, partly in section, of the spring lifting member for the interpreter supporting mechanism, and

Fig. 62 is a view in perspective of an alternative form of clutch release mechanism.

Construction and operation in general

As previously stated, the invention is illustrated in connection with a translating punch. Referring to Figs. 1 and 2, the machine, in connection with which the invention is described, may be divided, for purposes of description, into a head section, designated by reference number 10; an intermediate or interpreter section 11, and a punch section 12.

The mechanism of the head section 10 is closely similar to the sensing mechanism shown and described in my copending application Serial No. 538,429, filed May 19, 1931.

The intermediate section 11 resembles generally, although not in detail, the connection box or multiple translator, which has been extensively used in tabulating machines of the Powers type. It consists, generally, of a frame, readily insertable and removable from the machine, in which appropriate translator members are positioned as will be later described.

The punch mechanism 12 resembles generally a punch device of the Powers type from which the key members and translating carriage have been removed.

The essential method of operation of the machine may most conveniently be observed from the diagrammatic showing of Fig. 3. As shown in this figure, the head member may include a field of sensing pins 14, which are mounted in a suitable frame and reciprocated downwardly and upwardly during each cycle of the operation of the machine. These pins are adapted to cooperate with the previously perforated data card 15, which, for purposes of this disclosure, may be considered as the first substitution of the original data or information. The card member 15 is positioned between the pair of perforated plates 16, constituting a card chamber, and conveyed thereto and removed therefrom by mechanism, which will be later described.

The card 15 is conveyed to the chamber 16, while the pins 14 are in an elevated position. Thereafter, the pins 14 in their frame are lowered and certain of the pins find perforations in the card 15 and pass therethrough. Those pins, which find perforations and pass therethrough are thereupon locked in the bottom position by movement of the latching plates 17 at an appropriate time in the cycle. Thereafter, continued downward movement of the pins 14 will cause those which are held down by the latches 17 to meet the upper end of the interpreter, interponent, or translator, members 18. Still further downward movement causes movement of the members 18, which movement is a still further substitution, and by appropriate mechanical means may be caused to represent an appropriate translation. This movement causes a movement of certain of the punch gags 19, which, in turn, are latched down by the latching plates 21 in the punch member 12. The latching action is obtained by means of the springs 22. Thereafter movement of the punch chamber plates 23 will cause the punch members 24 to produce the desired perforations in the secondary or copy card 25. Thereafter, the latch plates 21 are released by the retract interponents 26 as a part of this sequence of operations. The previously outlined substitution steps are conducted to produce a second card corresponding to, but different from, an original card, the difference being such as is produced by the predetermined law of operation of the machine.

A number of different operations may be performed by the machine, and, for purposes of description, the following outline based upon the disclosure in my above mentioned co-pending application, S. N. 616,926, now Patent No. 2,004,208, is given.

The master or original card, which controls the setting of the gags 19 may be held in the sensing chamber 16 for a determinate plurality of reciprocations of the sensing mechanism, so that the gags 19 will be set and reset for a corresponding plurality of cycles, thus effecting the punching of a corresponding number of cards, which may be duplicates, and may correspond to, or may be modified from, the card sensed by the pins 14. Normally, the locking slides 21 are always released at the end of each cycle of operation by a reciprocation of a universal retract bar 31 (Fig. 4) operating on the cam portions of the retract interponents 26. Or, one or more of the retract interponents 26 may be turned out of the path of the universal retract bar 31 as is diagrammatically indicated in Fig. 4, so that some, and only some, of the locking slides 21 will be released by the said retract bar. Therefore, if a gag (or gags) 16 is depressed in those columns of the card corresponding to ineffective interponents, a repetition of certain data may be punched in the cards passing through the punching chamber, even if the corresponding field (or fields) in the master control card is blank. It will also be understood that the translator or interpreter member 18 of the intermediate component 11 may be offset or transposed in various ways as will be hereafter described.

It may be desirable to transpose the perforations, which occur in an upper 90 column field to a lower 90 column field, when duplicating cards such as those which may have been punched by the device described in my co-pending application, S. N. 537,831, filed May 16, 1931.

It may also be desirable to transpose perforations representing debits and credits along with the corresponding control holes of cards, such as those illustrated in the co-pending application of Wegener, S. N. 504,336, filed Dec. 23, 1930.

It is obvious that a partially perforated card may be fed into the sensing chamber 16, and certain of the gags 19 set; then the corresponding retractor interponents 26 disabled, and, thereafter a second master card may be fed into the sensing chamber 16 to set other gags 19, and in this way reproduce data which has been perforated on a plurality of master cards.

A predetermined number counter, designated generally as 27 (Figs. 1, 2 and 19), may be set to a predetermined indication and the machine will automatically operate to perforate duplicates or substitutes of the card in the sensing chamber of the head, until the pre-set number of duplicate cards has been perforated.

The machine is started by depressing a trip key 28 (Figs. 1, 2, 13 and 17). A depression of this key releases the main driving clutch and the machine will continue to operate until stopped by another depressing of the start key 28, or by an equivalent automatic operation controlled by the usual presence-of-card detecting pins of the card magazine, or by the predetermined numbering device 27. It may sometimes be desirable to print consecutive numbers on the cards which are being perforated. This numbering of the cards may be effected by depressing the numbering key 29 (Figs. 1, 2 and 15).

It is sometimes desirable to set the gags 26 under the control of a master card, then hold the gags in depressed position by disabling the universal retract bar 31, particularly, when it is desired to have many hundreds or thousands of cards having identical characteristics. This may be done by depressing the retract control key 32, and shifting the presence-of-card sensing lever 33 (Figs. 1, 2, 16 and 17). The lever 33 disables the card presence detecting pin of the master card magazine, thus enabling the punch to operate even if the master card magazine is empty.

The multiple translator 11, as shown in Fig. 12, is an interchangeable unit, as in the familiar Powers tabulating machine, and special provision is made for readily interchanging differing translators, as will be described in greater detail hereinafter.

In outline, the multiple translator contains the interponent wires, which transfer the substitutions from the sensing pins 14 to the punch gags 19. The translator member may conveniently be used in two sections, the upper basket 11*a* and the main basket 11 (Figs. 5 and 7), and translations, transpositions, etc. of various sorts may be produced in either or both of these units;

which translations thus occur in sequence and may be utilized for the conversion of a set of substitutions in one code to a norm, and thereafter from the norm to another code.

Both the upper and lower translator baskets are readily removable and interchangeable, which feature is an important element of the device of the invention.

Framework

The framework of the machine may be of any suitable form and material. For purposes of illustration, the machine has been shown (Fig. 1) as supported by a plurality of legs **34** attached to a main base plate **35** (Figs. 1, 2, 6 and 8) which supports the entire machine. The mechanism of the base member is supported by and carried by the usual side frames **36** attached to the base **35**; also carried by the frames **36** is a supporting member for the blank card receiver **37** and the discharge receptacle **38** (Fig. 6). Mounted on the side frame **36** are intermediate frames **39** (Figs. 2, 5, 6, 7 and 8) which form spacers for the positioning of the multiple translator **11**, and for supporting the head member **10** of the machine. Carried by the frames **39** are the side frames **41** of the head of the machine. The said side frames **41** are bound together by suitable ties and the said frames, like the frames **36**, carry the master controlling card receptacle **42** (Figs. 2, 5 and 10) and the corresponding discharge receptacle **43** (Fig. 5).

The entire framing, so far described, may be protected or hidden by a suitable case shown in Fig. 1. It is desirable to have access to a series of latch controlling members **44** (see Figs. 1, 2, 3 and 9). To this end, the casing is provided with a hinged top or lid **45**. The case may also be provided with shelves **50** for supporting desired objects, such as stock cards, etc.

Interpreter member

The interpreter member **11** of Figs. 1, 2, 5, 6, 7 and 8 is shown in further detail in Fig. 12. As shown in the figure, it consists essentially of a frame member **11** by which the interpreter basket as a whole is identified. At the bottom of the basket are flanges **94** as are elsewhere described, which are adapted to fit into the rabbeted grooves of the blocks **95**, as shown in Figs. 1, 2, 6, 8 and 13. The interpreter wires **18** extend, as shown, between the upper and lower plates of the basket member **11** and finger latch members **102** are provided.

The interpreter shown in Fig. 12 is constructed with the interpreter wires **18** extending vertically from the upper face to the lower face of the basket. This arrangement, however, is designed only for the direct repetition or exact reproduction of code cards, and in the event that any changes or translations are desired, the wires **18** take more or less devious and modified paths. The wires may be led sidewise by the desired amount to interchange the position of the fields. They may also cooperate with blocks, floating levers, transfer slides, etc., for the various translations required, and they may be replaced by fixed stops of various types either in the basket itself or below the basket for inserting constant perforations for various purposes.

The auxiliary interpreter **11*a***, shown most clearly in Figs. 5 and 7, also consists essentially of a frame member **11*a*** by which the interpreter basket as a whole is identified. It is provided with two flanges having openings through which screws **40** extend and secure the basket **11*a*** to the head frame **41**, as shown most clearly in Fig. 7. The interpreter shown in Fig. 7 is constructed with the interpreter wires **18*a*** extending vertically from the upper to the lower face of this basket, while that shown in Fig. 5 is constructed with the interponents **18*b*** extending in the same manner between these faces. As stated above, however, this arrangement is designed only for the direct repetition or exact reproduction of code cards, and when translation of data to a different code is desired, the interpreter wires **18*a*** and the interponents **18*b*** are arranged differently.

Main driving mechanism

The main shaft of the machine may be driven in any suitable manner, such as by an electric motor **46** (Fig. 2) for rotating the free member **47** of a clutch **48** (Figs. 2, 17 and 18). This clutch may be of any suitable construction such as, for example, that shown in my Patent No. 1,819,317, granted June 16, 1931. One member of the clutch is fixed to the main shaft **49** for operating the mechanism of the base component.

At one end of the said shaft **49** is attached a sprocket wheel **51**, which may be connected in a suitable manner, such as by a silent chain **52**, to the sprocket wheel **53** (Figs. 2, 7, 8 and 11) fastened to the main shaft **54** of the head of the machine. The chain **52** passes over a tensioning idler **55**, rigidly attached to the shaft **56** (Figs. 2 and 19), which may be used for operating the pre-set counter mechanism step by step. The two main shafts **49** and **54** rotate in the same direction at equal speeds.

The main shaft **49** of the base is provided with an eccentric **57** (Fig. 6) for oscillating the rocker arm **58** for driving a picker **59** to feed blank cards sequentially from the bottom of the weighted stack in the stock magazine **37**. A series of continuously rotating feed and skid rolls **61** is provided for feeding the cards into the punching chamber **23**, thence rearwardly, after the card has been perforated, through a pair of continuously rotating ejecting rolls **61** to a receiving magazine **38**. The entire series of rolls **61** are geared to the shaft **49** and the upper roller of each pair is held resiliently in contact with the lower roller of the pair in the well known manner.

Attached to the main shaft **49** is a cam **62** for rocking the spring pressed arm **63** for interposing a card stop **64** at the proper time into the path of the card in the punching chamber **23** so that it will remain stationary during the perforating operation, and then withdrawing the said card stop to permit the perforated card to be ejected into the storage magazine **38** (Fig. 6). The die block forming the bottom plate **23** of the card chamber is caused to move upwardly, then downwardly by means of a suitable cam fixed to the shaft **49** in the manner well known in the art, for the purpose of forcing the blank card against certain punches **24**, some of which are held against movement by depressed gags **19** as has been previously described hereinabove.

Also attached to the shaft **49** is a cam **65** which is adapted to reciprocate a link **66** for operating the universal retractor bar **31** (Figs. 2, 4, 6 and 13). The operation of the link **66** is determined by the position of the retract control key **32**, as will be described more fully hereinafter. A shaft **67** (Figs. 2 and 15) is connected to the main shaft **49** in a suitable manner, such as a chain, for rocking a bell crank lever **68** to effect

the printing of consecutive numbers on the perforated card.

Attached to the stub shaft 56 (Figs. 2 and 19) is an eccentric 71 for reciprocating the link 72 for driving the predetermined numbering counter step by step.

Head member

The main shaft 54 of the head component member 10 is provided with a pair of cams 73 (Figs. 2, 5, 7, 10 and 11). The levers 74 are held in contact with the cams 73 by pairs of stout springs 76 Figs. 2, 7, 10 and 11) anchored to a stationary bar 77 at the extreme top of the machine. The tension of said springs 76, which hold the levers 74 in contact with their cams, tends to elevate the sensing head mechanism frame 75. Also attached to said shaft 54 is a gear 78 (Fig. 10) which drives the series of pairs of feed rolls 79 (Fig. 7) through a train of spur gears 80 shown in Figs. 2, 9, 10 and 11. The operation of the rolls 79 corresponds to the above described rolls 61, and will not be further described.

Also attached to the shaft 54 is a cam 81 for oscillating a spring pressed lever 82 (Figs. 2, 5, 9 and 11) which oscillates the card stop shaft 83 through a link and crank mechanism for positioning card stops 84 to temporarily hold a master card in the sensing chamber of the head component.

The card stop may be used as a fixed stop, as shown, or a variable card stop, suitable for changing the position which the card assumes, may be used, as shown in my copending application S. N. 637,401, filed October 12, 1932. A similar clamped slide may be used for adjusting the stop, or various forms of adjusting means, operable from a distance may be utilized.

Sensing mechanism

The sensing mechanism comprises a reciprocatory pin box frame 75, having a pin 14 for every possible perforation of a card; mounted for slidable movement on a pair of guide standards 85 on opposite sides of the machine (Figs. 2, 5, 7, 9, 10, 11 and 28). Each row of sensing pins 14 is provided with a spring-pressed locking plate 17. (See also Fig. 3). Normally the pins 14 are pressed downwardly solely by the light springs surrounding their upper ends. While the sensing box 75 is descending, the pins 14 search for perforations in the master card. The pins, which do not find perforations, are restrained from further movement. After those pins, which have found perforations, have passed a predetermined distance through the card, the locking slides 17 are released for a limited extent of horizontal movement and lock the pins 14 in normal position relatively to the moving frame 75. At this time all pins 14 (Fig. 3), which have not found perforations, have their locking studs elevated beyond the locking points of the plates 17. Continued downward movement of the pins 14 forces the interponents 18 downward against stronger springs and causes the translators 11*a* and 11 to set the punch gags 19, corresponding to the particular requirements of the multiple translators between the sensing pins 14 and the gags 19.

In the event that there is no card in the sensing chamber 16 to be read by the pins 14, it is necessary to keep all the slides 17 disabled. To this end, the sensing head is provided with a pair of coarse sensing pins 86, which are adapted to sense the presence of a card by contacting with its extreme edges (Fig. 9). The pins 86 are guided in brackets fixed to the castings of the sensing head 75, and their upper ends are bifurcated to receive light spring-pressed locking levers 87.

If the pins are elevated, due to the presence of a card, the locking levers 87 will be shifted out of interfering position with corresponding rocker arms 88, which, in turn, are attached to retract bar shaft 89. The lower ends of the rocker arms 88 are connected by a bar or bail 91, which in normal position holds all the locking slides 17 in the ineffective or extreme right hand position by means of an arm 92 attached to said shaft 89, which, in turn, cooperates with the active portion of a stationary cam 93. When the sensing head descends a roller on arm 92 passes off of the active or high portion of the stationary cam 93, and onto the low portion shown in dotted lines in Fig. 9, thus permitting springs 92*a* to rock arm 92 and rotate shaft 89 in a clockwise direction, thereby moving bail 91 away from the ends of the slides 17 and permitting the springs 44*a* to shift the slides 17 to their extreme left hand or locking position. If, however, no card is in the sensing chamber, the locking levers 87 are in the path of a flange on the rockers 88, thus holding bail 91 in normal position irrespective of the position of arm 92 with respect to the stationary cam 93 and thereby preventing the springs 44*a* from moving the slide 17 to their extreme left hand or locking position. In this case, the pins 14 are not locked by the slides 17 when they are depressed by the lowering of the sensing head 75. The springs 14*a*, which force the pins 14, downwardly are much weaker than the corresponding springs 18*a* (Fig. 3), which hold the interponents 18 elevated, hence none of the interponents are forced downward, and, therefore, no gags 19 are set if there is no card in the sensing chamber.

If desired, one or more of the slides 17 may be positively held in normal retracted position by means of the manipulative locking slides 44. (See particularly Figs. 1, 2, 3 and 9.) The manipulative devices 44 are used when it is desired to disable one or more columns of the sensing head to prevent the repetition of data in a certain field (or fields) of the master card being sensed. The corresponding pins 14, which find perforations, are unable to move the corresponding interponents 18 downward for the reason given in the last paragraph.

The above description covers the card handling mechanism for operation on either standard Powers type of cards, that is, the 45 column card having twelve digit holes, or the 90 column card of the same size, having 90 columns arranged for a one and two hole perforation code. The disclosure of Patent No. 2,004,208 upon which the above description is based shows only a machine adapted to straight duplication of standard Powers type of cards, the single machine being equally well adapted to reproduction of 45 column or 90 column cards.

However, by suitable modification, as suggested in the above mentioned patent, a certain amount of transposition of position of data in the various fields is obtainable, as well as the removal or addition of data in the same code.

Thus, it may happen that the master card to be sensed is perforated in the 90 column or Lasker code, and perforated in both upper and lower fields, and it may be desired to disable one or the other, or both co-columnar fields. The construction for effecting such operations is dia-

grammatically illustrated in Figs. 22 and 23. It will be seen in those figures that the slides are provided in pairs for each column of pins, the respective slides being located on opposite sides of the column of pins, with latch openings occupying only half of the length of each slide and the blank portion of one slide in a position opposite the latch openings on the other slide. The sensing pins 14 are arranged "right and left"; that is to say, the locking pins of half the said sensing pins extend in one direction and the remaining half have their locking pins extending in the opposite direction. Thus the side protrusions on the pins of half of those in a given column are adapted to cooperate with the locking openings in one slide, and the side protrusions on the other half of the pins in a column cooperate with the other slide. Thus the two slides will lock any or all of the pins in a column, but either or both of the slides may be held in non-locking position by means of the members 44. Portions of one of the locking slides 17 are cut away to provide room for the springs and locking slides of the other slide.

Interponents

The above described mechanism includes the sensing head mechanism and the punch mechanism, and in Figs. 3 and 12 is indicated a simple connection or interponent system between the sensing head and the punch mechanism. This simple connection, however, is adapted only to the duplication of cards, substantially without change.

An essential portion of the present invention is to be found in the construction and arrangement of the interpreters or translator members, indicated at 11 in Figs. 1, 5, 6, 8 and 12 and indicated at 11*a* in Figs. 5 and 7. The standard lower translator described for straight duplication of cards is shown in Fig. 12 and the standard upper translator 11*a* arranged for straight duplication of cards is shown in Figs. 5 and 7. In the prior art, multiple translator members or baskets for tabulators have been developed to incorporate interponent members arranged to transpose data from one field to another, in the same code, and also to duplicate data from one field on the card to several fields on the tabulator head by the use of Y wires as shown by Patent No. 1,884,072 granted October 25, 1932 to J. R. Merkle. Interpreter baskets of the type just mentioned form part of the present invention, as do also the transposing members of the type just referred to.

One of the lower multiple translators 11, is shown in Fig. 12. These translators are arranged so as to be interchangeable and thereby greatly increase the utility and convenience of the punch. The bottom of the multiple translator is provided with flanges 94 which fit into rabbeted grooves of the blocks 95 (Figs. 1, 2, 6, 8, 12 and 13). The blocks 95 are slidably mounted on frame supported screws 96, and are normally urged upwardly by strong springs; but the said blocks are normally held against the spring tension by resiliently urged locking slides 97, Figs. 13 and 14. Each locking slide 97 is provided with a front, middle and rear slot, as shown in Fig. 14. The rearward movement of each slide is limited by a screw positioned in the rear slot and threaded into the associated block 95. Each slide is normally locked to the associated screws 96 and the two slides then hold the blocks 95 against the tension of the spring 96*a*. Each slide has positioned in its first and middle slots a screw 96 which is provided with a shoulder at the proper position on its shank. The edges defining the rear end of these grooves on each slide are held below the shoulder just mentioned by the tension of a spring extending between a first pin extending through an opening in the slide and fixed to the associated block 95 and a second pin fixed to the slide. When it is desired to remove one of the translators 11 a finger piece 98 is rocked upwardly and arms 99, fixed to the shaft 101 carrying the finger piece 98, move rearwardly carrying with them the locking slides 97 whereupon the previously mentioned edges on the two locking slides are moved out of the path of the shoulders on the screws 96, thereby permitting the blocks 95 to be raised by the springs 96*a*; the heads of these screws limiting the upward movement of the blocks. As soon as the rabbeted blocks 95 are elevated to the limit permitted by screws 96 the multiple translator 11 may be removed in the ordinary way by the manually controlled pinch latches 102 at the lower forward edge thereof as is well understood in the art. When a new multiple translator is slid into the machine and locked by its pinch latches to the rabbeted blocks 95 the lever 103 is depressed until the previously mentioned edges of the locking slides 97 snap under the shoulders on the screws 96. The lever 103 is fixed to a shaft 104 near the rear of the machine, which shaft also carries a forwardly extending lever 105 remote from the lever 103 so that, when the shaft 104 is rocked by the lever 103, the arm 105 thereon coacts with projections on the rabbeted slides 95 to force both of them down simultaneously, thus locking the new multiple translator into operative position.

The upper multiple translators 11*a*, as shown in Figs. 5 and 7, are also arranged to be interchangeable. These translators are placed in the machine before the lower translator 11 is put into place, and as previously stated, are screwed to the head frame 41. When the translator 11 has been detached from the machine, the screws 40 are loosened and the translator 11*a* may then be removed from the machine.

It is desirable to prevent the machine from being started before the multiple translators 11 and 11*a* are in position in the intermediate section of the machine. To effect this purpose, a link 100 is provided which locks the starting button 28 whenever the translator 11 is not in position, thus making it impossible to start the machine. The stem of the button 28 is pivoted to the frame and is provided with a pin which extends through a slot in the link 100. The link 100 is pivoted on one of the blocks 95. When this block 95 is in its lowered position, the pin on the stem of the key 28 is so positioned in the slot in the link 100 that the plunger 117 can be depressed far enough to start the machine. When, however, the block 95 is raised, the pin on the stem of the key rests against the front end of the slot in the link 100 and the plunger 117 cannot be depressed far enough to start the machine.

Predetermined counter

The predetermined counter is best shown in Fig. 19. It consists of a pair of ratchet discs 104, each of which is attached to one of a pair of concentric sleeves 105, extending outwardly to a pair of manually manipulative knobs or dial buttons 106, so that each may be independently set to a predetermined position. One of the discs 104 is provided with one hundred ratchet teeth. The one hundredth tooth space is of sub-

stantially double depth. The other disc is provided with about one dozen teeth. A scale plate 107 is provided having an opening for reading the graduations on the hundred toothed disc, and a pointer for indicating the position of the other disc. The said discs 104 are held against accidental displacement by a usual form of spring-pressed retaining pawl 108. A radius arm 109 carries a spring-pressed operating ratchet 111 for the discs 104. The radius arm 109 is connected by a link 72 to an eccentric strap surrounding an eccentric 71 attached to the idler shaft 56 so that each time the idler shaft 56 makes a complete revolution (or what is the same thing, one card is perforated) the hundred toothed disc 104 is advanced one ratchet tooth, and, when it has advanced an amount corresponding to one hundred teeth, if it is set to 0, or when it has advanced the number of teeth, as 54, to which it is set, the actuating pawl falls into the deep notch and the next rotation of shaft 56 advances both the ratchet discs one tooth simultaneously, and thereafter advances the hundred tooth disc a single tooth at a time until it has made a complete rotation. Thus, if the hundred toothed disc has been set at 0, and the twelve toothed disc at 8, the hundred toothed disc will make eight complete revolutions and the twelve toothed disc will be moved eight teeth. When this has been accomplished both discs will stop at 0. If, on the other hand, the hundred toothed disc is set at 54, and the twelve toothed disc at 9, the latter disc will move one tooth when the former disc has moved fifty-four teeth. Thereafter, the twelve toothed disc will move one tooth only when the hundred toothed disc has moved one hundred teeth. When the hundred toothed disc has made one partial revolution and eight complete revolutions, the twelve toothed disc will have moved from 9 to 0. In the first mentioned setting of the discs, the twelve toothed disc will arrive at 0, when eight hundred cards have been punched, while in the second setting, the twelve toothed disc will arrive at 0 when eight-hundred and fifty-four cards have been punched. When both discs 104 have been rotated to their zero positions, the next operation causes a projection 112 on the disc having the fewer ratchet teeth to rock an offset bell crank 113 and an arm 113A connected to opposite ends of a rock shaft to pull the core 114 of a Bowden wire to disable the main driving clutch 48 thus stopping the machine after a predetermined number of duplicate or substitute cards have been perforated.

Trip key

In order to start operation of the machine the trip key 28 (see Figs. 1, 2, 13 and 17) is depressed. When it is desired to stop the machine the same key 28 is again depressed. The machine is automatically stopped if the stock cards in either magazine 37 or 42 have become exhausted, or if a predetermined number of cards have been perforated. The machine is driven through any suitable form of clutch 48 (see Figs. 17 and 18). The said clutch may be, for example, that disclosed in the patent to Lasker, No. 1,810,317, granted June 16, 1931. The free member 47 of the clutch 48 is normally held against rotation by a buffered stop plunger 115, which in turn is pivoted to the top arm of a spring pressed irregular cruciform lever 116. When the trip key 28 is depressed, a stem integral therewith and in the form of a bell crank (see Fig. 13) depresses a spring pressed plunger 117 (see Fig. 17) which in turn shifts the wipe-slide 118 downwardly to rock the cruciform lever 116, and when the said lever 116 has been rocked by the wipe-slide 118 a distance sufficient to withdraw the buffered plunger 115, a pin 119 thereon is engaged by a notch on the spring pressed inverted T-shaped lever 121 and is thereby held in shifted position as is best shown in Fig. 18. Comparison of Figs. 17 and 18 shows that the bottom end of the wipe-slide 118 is shifted slightly towards the clutch 48, such shifting, however, being of an extent sufficient to cause the wipe-slide 118 to miss a projection on cruciform lever 116 when the trip key 28 is again depressed. Another depression of the key 28 will now cause the lower end of wipe-slide 118 to contact with a shelf or ledge on the inverted T-shaped locking lever 121. The contact between members 118 and 121 causes the latter to be rocked slightly clockwise, thus releasing the irregular cruciform lever 116. It is thus seen that a first depression of the key 28 will set the machine into operation, and a second depression thereof will stop the machine.

The inverted T-shaped lever 121 carries a pin 122 extending perpendicular thereto which lies in the path of a pivoted lever 123. The lever 123 has pivoted near its extreme end a feeling plunger 124 for detecting the presence of stock cards in the magazine 37. When the cards in the said magazine 37 become exhausted, the feeling plunger 124 attached to the lever 123 will rise under the influence of a suitably located spring 125, thus depressing the pin 122 attached to inverted T-shaped lever 121 to release the cruciform lever 116 and thus stop the machine.

Similarly, the upper or master card magazine 42 is provided with a spring urged lever 126, a spring 127 therefor, and a sensing pin 128. The lever 126 is connected through link 129 and a bell crank mechanism 131 to a bell crank 132 beside the lever 123 so that when the magazine 42 becomes exhausted the pin 122 on latch lever 121 will be rocked as before, and thus stop the machine. Sometimes it is desirable to permit the machine to operate even after the magazine 42 is exhausted. This may be done by simply holding the lever 126 in the position shown in Fig. 17. A special key or lever 33 (see also Fig. 16), which has the form of an offset bell crank pivoted in the casing of the machine, has a laterally extending stud overlying the lever 126. The key 33 as shown in Fig. 17, permits the lever 126 to stop the machine. However, if it is shifted counterclockwise, the stud thereon will hold the lever 126 depressed, and thus disable the sensing pin of the upper magazine 42. The spring pressed plunger 33*a* is provided on its rear face with a pin (not shown) which is adapted to fit into two holes in the front plate, one of which is shown to the left of key 33 and the other of which is concealed by the key in Fig. 1; the pin on the plunger cooperating with these holes and enabling the key 33 to be locked in either of its two positions. When the plunger 33*a* is positioned in the right-hand hole, as shown in Fig. 17, the punch is adapted to act as a reproducing punch, that is, for each master card positioned in the head sensing chamber, another card is punched. In this case the machine is stopped when the master card magazine 42 becomes empty. When the plunger 33*a* is positioned in the left-hand hole, shown in Fig. 17, the punch is adapted to act as a duplicating punch, that

is, is adapted to produce a predetermined number of cards from a master card. In this case, a single master card is placed in the card magazine 42, and either the counting mechanism stops the machine when the predetermined number of duplicate cards are punched, or the pin 124 stops the machine if the card magazine 37 becomes empty before this number of duplicate cards is punched.

The core 114 of the Bowden wire (Figs. 17 and 19) is connected in any suitable manner to the stud on the inverted T-shaped latch member 121 so that when the core of the cable is drawn downwardly (as viewed in Fig. 17) the machine will be stopped as above described. The core 114 of the said Bowden wire, as previously stated, is connected to the stopping lever 113 of the predetermined counting mechanism shown in Fig. 19.

Numbering mechanism

It is sometimes desirable to count the number of cards which are perforated by the machine, and to print consecutive serial numbers on the cards just after they have been perforated. This mechanism is in the nature of an optional attachment and is similar to that fully shown and described in the patent to Lasker No. 1,855,133, granted April 9, 1932. This mechanism is best shown in Figs. 2, 15 and 21. A numbering head 133 is carried by a sturdy rocker frame 134 which is normally urged upwardly by a strong spring (not shown). This frame is pivoted to the upper plate of a printing chamber located just beyond the pair of eject rolls 61 (see Fig. 2). When the numbering attachment is included with the machine, it will be understood that the receiving magazine 38 (Fig. 6) is located beyond the printing chamber as is well known in the art. Pivoted near the supported numbering head 133 is a spring urged hook 135, which is normally engaged by the bell crank 68, which, in turn, is oscillated by a cam on the shaft 67 which rotates in synchronism with the main shaft 49. Therefore, every time that the main shaft and the head shaft 67 complete a rotation, the hook 135 is drawn downwardly to impress the number at printing position on the numbering head 133 on to the edge of the card in the printing chamber. Any suitable form of inking ribbon mechanism may be associated with the numbering head 133. Such mechanism is indicated generally as 136 (Fig. 2).

Counter

The upper end of the spring pressed frame 134 is connected by a link 137 (Fig. 15) to a frame supported offset bell crank 138, which, in turn, is connected in any suitable manner to the crank of a consecutive counting device 139. Therefore, the consecutive counter 139 will be operated for each and every rotation of the shaft 67 if the hook 135 engages the arm of the crank 68. If it is desired to disable the numbering mechanism the key 29 (Figs. 1, 2 and 15) is depressed. The stem of the key 29 extends rearwardly to a pivot on a frame-supported offset bell crank 141, one arm of which carries the spring pressed latch 142, so that, while the said key 29 is being depressed, the latch 142 will snap under a projection on the hook 135, then continued movement of the key 29 will disable the connection between hook 135 and arm 68. There is a notch in the stem of the key 29 for holding it in depressed position. The actuating means for the numbering head 133 is shown in Fig. 21, and completely described in my co-pending application, S. N. 616,926, now Patent No. 2,004,208. This means consists of a suitable crank fixed to the actuating shaft of the numbering head, having a pin which fits into an elongated slot in a bracket 143 fastened on top of the printing chamber. When the spring pressed frame 134 is shifted upwardly and downwardly during a printing operation, the crank attached to the shaft of the numbering head is oscillated to advance the units wheel of the numbering head one step. Each numbering head is provided with a plate for guiding and supporting it in a pair of rabbeted grooves, as is clearly illustrated in Fig. 21. If desired, the numbering heads may be differently located on the differing supporting plates, so that one numbering head will print its numbers near the margin of the perforated cards, and the other will print its numbers further from the card margin. A suitable snap lock, or clamping screw may be used to lock any numbering head inserted into the spring urged rocking frame 134.

Retract key

When the predetermined counting mechanism shown in Fig. 19 is set for operation, it is necessary to disable the retract mechanism which operates upon the retracting interponents 26 (Figs. 3 and 4). The retract mechanism (Figs. 2, 3, 6, 13 and 20) comprises a cam 144 attached to the main shaft 49, which is adapted to shift a strut 66 (Fig. 20) upwardly to rock a shaft 145, which carries the retract bar 31. The strut 66 has pivoted on its lower end a spring tensioned follower through which the cam 144 actuates the strut. The retract bar 31 wipes over the camming surface of the retract interponents 26 (Fig. 4) to shift the locking slides 21 against their springs to release any gags 19 which may have been set or depressed. It will be noted that the sensing pin and punch gag locking slides are moved in opposite directions in order to be set in their locking positions. This is the normal operation of the machine, when each card fed through the head 10 is duplicated by the punches in the base 12. When constructing a group of substitutes the follower is shifted out of the path of the cam 144 by a sliding key 32, which has a notch embracing the strut 66. The retract bar 31 is thus removed from control of the cam 144. The key slide 32 is resiliently held in either of the two positions, the active and the inactive, by a suitably located spring urged pawl which is adapted to engage either one of two notches in the edge of the key stem.

Timing

The times at which the movements of the sensing pins 14, the die 23, the master card 15, and the blank card 25 occur, as they are punched are shown diagrammatically in Fig. 24. The timing diagram is really two super-imposed diagrams, the one for the head 10, the other for the base 12. A cursory examination shows that the sensing pins 14 and the die 23 have approximately the same extents of movement but in opposite directions with a phase difference of approximately 160° lag for the die. Similarly the movement of the master card with respect to the blank card to be perforated differs in phase by approximately a 140° lag for the blank. The timing diagram illustrates two complete cycles of the machine as is indicated by the two series of abscissa running to 360°.

Following the master card, it is found that the

card is picked from the stack after a movement of about 10°. At about 110° the master card enters the feed rolls 79, and reaches the sensing chamber 16 at about 170°. While the card is still moving the sensing pins 14 begin to move downwardly to sense the master card 15, but before an appreciable movement of said pins has occurred, the card reaches the card stop (about 270°). The card is then at rest and remains at rest for a period of about 230°. After the card has been at rest for about 40° the sensing pins 14, which have found perforations in the master card, are locked and the continued downward movement of said pins results in the setting and latching of the gags 19 at about 60° of the second cycle. The die starts upward to punch the blank card shortly before the gags 19 are set. The sensing pins 14 remain at rest in their lowest position for a period of about 10° when they start upward, and are released at about 110° of the second cycle. The punches touch the blank card shortly after the gags 19 have been set and punching occurs shortly after the sensing pins 14 have been released. At about 140° of the second cycle, the card stop is withdrawn while the pins 14 are still moving upwardly; the master card is being fed into the eject rolls; and finally the card clears the eject rolls at about 200° of the second cycle slightly before the die reaches its maximum elevation. The blank card in the base of the machine has very nearly the same sequence of movements, except that it is lagging about 140° in phase. The die has approximately the same timing as that of the sensing pins just described, except that it lags approximately the same 140° behind the sensing pins.

Two cards in both the head and base of the machine are moved at the same time. This is indicated at the top and bottom parts of the timing diagram, where a repetition of the described timing occurs. Thus the legend "machine stops" occurs at 360° as well as at 0°. Inspection shows that this and the other legends pertaining to the card are retarded 360° in phase, so that one card is being picked up and fed into the feeding rolls while the other card is at rest in the sensing chamber and, further that the second card enters the sensing chamber very shortly after the card stop has been withdrawn and the sensed card is being fed to the ejecting rolls. Similarly the bottom of the diagram shows the progress of a second blank card which overlaps the progress of the card which is in the punching chamber. This overlapping of the progress of cards results in a considerable increase in the work performed by the machine.

Translator interponents

The previous description of the mechanism has dealt broadly with two of the main elements,—the sensing head member 10 and the punch member 12. These members are adapted to be connected and combined into a single operative unit by an intermediary, which is the interponent system, or multiple translators 11 and 11*a*. The translator consists, as is shown in Fig. 12, of a framework and a plurality of movable members therein, extending between the top face and the bottom face. The members at the top face are adapted to receive substitutions consisting of movements received from the sensing head, and at the bottom face to transfer substitutions to the punch member, and, what is an essential element of the invention, to produce, in the course of the passage through the member, a translating substitution of such character that a substitution, received at the upper face in one code, is delivered to the lower face in another code.

The translator interponent 11 is supplemented by an auxiliary interponent system 11*a*, as shown in Fig. 5. Both of these members, as previously stated, are adapted to ready removal from the machine for replacement by other interponent members. The method of removal of the interponent members, or translator baskets 11 and 11*a*, has been previously described.

The function of these various members and the character of substitutions, which govern the design of that function, may most conveniently be illustrated by reference to diagram in Fig. 25. In this figure, a card "A" is indicated, in which is located one or more perforations representing, according to a selected code, some datum or item of information, which is sensed in the usual way to produce a substitution. This, as shown by the dotted lines, is reduced to a norm as indicated by the dotted plane B, which, for purposes of this discussion is most conveniently regarded as a single perforation, representing, according to its location at one of ten different points, a desired digit, there being for convenience and, according to the custom in the art, 45 columns in which such perforations may be located.

An actual card B, in the norm code, may be punched, if desired, and used for further substitutions, but it is usually more convenient merely to reduce the original code to the norm by appropriate substitutions, consisting of movements of translator wires, according to the normal code. From this norm a further substitution and translation may then be produced to convert to the desired code, which may then be utilized to obtain the punching of a card C, carrying the same data or items of information in another perforation code.

Translator system—90 columns to 45 columns

This principle is conveniently exemplified in the combination of elements diagrammed in Fig. 27 and shown in Fig. 26. This figure shows the upper feed rolls 79 as previously described (see Figs. 2, 5, 7, 9, 10 and 11), the sensing head 75, the sensing pins 14, the card chamber 16 and the ordinary auxiliary interpreter basket 11*a*. As indicated, each column of sensing pins 14 may contain twelve pins, thereby adapting the sensing head to operation with the 90 column code as further illustrated and described in connection with Fig. 22. The auxiliary interponent basket 11*a* is adapted to conduct a straight substitution without modification of the movements produced by the sensing pins 14 in response to the perforations in a card in the sensing chamber 16. The usual blank card magazine (not shown), and feed rolls, punch basket, etc., for the bottom or punch member 12, as shown in Fig. 30, are likewise provided, but are not shown in Fig. 26 for obvious reasons. A special system of gags 19 and latch members 21 are provided as shown in Fig. 26, three latch plates being provided for each column of punch gags; there being two lower plates, one being a front and the other a rear plate, each of which is provided with locking cutouts associated with one-half of the punch gags in a column, and an upper plate having locking cutouts associated with predetermined punch gags in the column.

It may be noted that the 90 column code cards, which are well described in my co-pending application, S. N. 547,822, filed June 30, 1931, now

Patent No. 2,044,120 granted June 16, 1936 will record twice as much data as can be recorded on the 45 column code cards. Accordingly, if more than 45 columns of the master card are punched to record information, a choice must be made therefrom, which choice is limited to 45 columns of data. However, the desired items of information may be chosen from either the upper or lower field.

The translator basket 11 is especially arranged as indicated. The interpreter wires 146 may be connected to substitution receiving interponent members at the top of the basket leading either to an upper field, or a lower field, in the 90 column code card, as shown in Fig. 26, and, as illustrated diagrammatically in Fig. 27. Mention may be made of the fact that a 90 column code is shown in Fig. 2 of the patent to Lebeis, 1,780,884, issued November 4, 1930. In Lebeis the bottom of Fig. 2 is the left-hand edge of the card as normally read and the drawing must be turned clockwise ninety degrees to read it properly. However, in the 90 column code as practiced in the United States the Lebeis code is substantially inverted. Thus it is present practice to use a single perforation in the first level [the leftmost in the normal position of Lebeis Fig. 2] to indicate a zero although zero is seldom indicated; a single perforation in the second level for the digit one; two perforations, one in the second and the other in the sixth level for the digit two; a single perforation in the third level for the digit three; two perforations one in the third and the other in the sixth level for the digit four, etc. Thus, the 90 column code consists of alternate single and double perforations for the significant digits.

It may be noted that the 90 column code does not usually use perforations for the zero, but that automatic zero stops are customarily provided in the tabulator to restrain the counting sectors in the event that no digit stops are actuated. However, most of the tabulators are also provided with zero digit stops cooperating with the tabulator sectors, which may be operated if a zero hole for the 90 column code is punched. This arrangement is of convenience, since it may be used to eliminate digit perforations in a column, this procedure requiring merely a perforation of the single zero hole. The translation from a zero perforation in the 90 column code to a zero perforation in the 45 column code may proceed as follows, although the 90 column zero is not customarily perforated.

It may be noted that the first sensing pin in the lower 90 column field, that is, the seventh of the sensing pins 14 from the left in Fig. 26, is adapted to convey its substitution through the auxiliary basket 11*a* to a translator wire in the basket 11, which starts from the seventh position from the left at the top of the translator basket 11. The translator wire in this position is then led to the third gag from the left in the punch system 12. It will, therefore, be obvious that, if a sense-able perforation occurs in the first or zero position of the lower column field, the corresponding sensing pin 14 will be depressed to move the interponent wire as previously described. Accordingly, by the above described system of substitutions, it will depress the corresponding translator wire leading to the zero position of the 45 column code as exemplified in the punch mechanism. Movement of the translator wire will then depress the gag 19 in the zero position and the gag is thereupon locked down by the front latch plate 21, as shown by the solid lines, and a hole is punched in the zero position in the replacement card according to the normal or 45 column code, whereafter the latch plates are released by the retract member 26.

The digit 1 is represented in the 90 column code in the lower field by a single hole in the fifth level from the bottom. Accordingly, if the digit 1 is punched according to the 90 column code, the eighth of the sensing pins 14 from the left on Fig. 26 will find the perforation and depress the interponent in the basket 11*a*, thereby depressing the corresponding interponent in the basket 11 and depressing both the fourth and fifth of the gags 19, that is, the gags representing the digits 1 and 2 in the 45 column code, since the translator wires are coupled together. It may be noted that, when the retract interponents 26 are operated to release the gags 19, the pin on the last gag 19 to the right, that is, is the nine position, cooperating with the rear lower slide 21, assuming it had previously been held in depressed position by the lower rear slide was allowed to rise to the limit of its upward travel, thereby engaging with a shelf portion of the slide opening as shown by the dotted lines. By this arrangement, the rear lower slide 21 is held out of action, and cannot latch down any of the gags 19 when the nine position gag is fully elevated. Accordingly when the fourth and fifth of the gags 19 are depressed, only the fourth is latched down by the front lower slide 21, the fifth being free to rise with the sensing pins 14. Accordingly, only a hole in the 1 position is perforated on the 45 column card.

If the digit 2 is recorded in the lower field column of the 90 column card, there will be a perforation corresponding to the eighth sensing pin 14 from the left; also a perforation corresponding to the twelfth sensing pin 14 from the left. Accordingly, when the card is sensed, both the eighth and twelfth of the interponent wires in the basket 11*a* will be moved downward for the appropriate substitutions, resulting in movement of the gags 19 in the 1 position, in the 2 position and in the 9 position. Since the gag in the 9 position is pushed down, the lower front latch plate 21 is disabled by the pin shown, thereby preventing the latching down of the gag in the one position. Likewise, the upper latch plate 21 is moved to the left by the movement of the gag in the 2 position, thereby preventing the latching down of the gag in the 9 position. Simultaneously, the rear lower slide 21 is released by movement of the pin in the twelfth gag off of the shelf indicated and the rear lower slide 21 enabled so that the gag in the 2 position is latched down by the back lower latch plate 21, as indicated by the dotted lines. The gag in the 2 position, thus is the only one latched down and only a hole in the 2 position is punched in the 45 column card.

It may be noted that under these conditions, the twelfth of the gags 19, that is, the one in the 9 position, does not rise to its original position when the sensing pins 14 rise. The pin on this twelfth of the gags 19 is caught under the shelf in the hole on the rear lower slide 21. However, the twelfth gag 19 is slightly shorter than the other gags, shorter by a sufficient amount so that even though it is held slightly depressed, it does not push its punch down low enough to be operable. When the code hole has been punched, the gags are all released by movement of the latch slides through operation of the retract in-

terponents 26, and the pin on the twelfth gag 19 returns to its full height of travel on the shelf in the perforation and disables the rear lower slide.

The 3 digit is represented by a single hole in the ninth from the left position of the pins 14, if it is in the lower field and it produces a single perforation in the 3 position of the 45 column card in a manner similar to that described for the 1 position.

A perforation for the 4 digit is produced in a manner similar to that of the 2 digit. The other digits are translated in similar manners, until the 9 is reached. This consists of a hole in the position of the twelfth sensing pin 14, and, accordingly, only the gag 19 in the 9 position is pushed down. It is latched by the upper of the latching plates 21, as indicated, and the proper hole punched in the 45 column code card.

The sequence of operations, as previously described, may then be proceeded with, successive cards being picked from the stack in the respective supply magazines, the previously punched cards being sensed and discharged to the storage magazine, the substitution produced by the sensing pins being translated as described, conveyed to the punch gags, the punch operated, and the newly produced card discharged to the storage magazines, all in a manner which will be obvious from the preceding description.

Thus, the newly perforated card is the norm, and the setting of the punch gags may be regarded as the plane of conversion to the norm, as shown in Figs. 25 and 27.

Translator—80 column to 45 column

In an attempt to record a maximum amount of information by perforations on a standard sized card, certain of the workers in the field have utilized a system in which a single narrow rectangular perforation, in any one of ten positions, indicates the desired digit. These perforations occupy the usual vertical height on the card, but are much narrower than the previously used round perforations; making it possible to utilize on the card 80 columns of single hole code. This type of code may be converted into the standard 45 hole code by means of the present invention. For this purpose a special sensing head, as shown in Fig. 28, is utilized.

This sensing head is, in general, closely similar to that previously disclosed in Figs. 2, 5, 7, 9, 10 and 11, but is modified in the number of rows of sensing pins and in the character of perforations in the sensing chamber plates and in the shape of the sensing pins. As shown in Fig. 28, the respective metal sheets forming the top and bottom of the sensing chamber 16 are perforated with closely spaced rectangular openings, corresponding to the perforations in the 80 column card, and the sensing pins 14 are then formed with square tapered lower ends instead of the usual tapered round ends of the ordinary sensing head pins. It will thus be noticed that broadly the essential change in the 80 column sensing head over the 45 or 90 column sensing heads lies in the modification in the shape of the sensing pins and the modification in the perforations in the sensing chamber plates 16 and the guide plates forming part of the sensing head frame 75. The head frame 75 is similar to that previously described, and it is similarly guided on the post 85 and lifted by springs (not shown) attached to the cross bar 77.

Latch plates 17, in general, closely similar to those of the previously described embodiments, are likewise provided. (They are, however, behind the first row of sensing pins 14 and are not clearly shown in Fig. 28.) A retract bar 91 is likewise provided, carried upon a retract shaft 89 by means of bracket 88 as in the previously described embodiment. This bar is operated by a cam lever 92 cooperating with a stationary cam as before described. A presence-of-card sensing pin 86 is likewise provided to actuate the lever 87 for blocking out of operation the sensing pins 14 when no card is present in the sensing chamber. The sensing head, as shown in Fig. 28, is attached to the framework in the same way as is described for the ordinary sensing head previously disclosed, and cooperates with the ordinary card storage, card traversing, and card receiving means, and a similar card stop 84 is utilized.

Since the 80 column card will also record more data than can be recorded by the 45 column card, it is necessary as before to select 45 columns of the desired data to be reproduced and translated. The substitutions involved are diagrammatically represented in Fig. 29, and the machine assemblage is shown in Fig. 30, in which the same reference numbers indicate corresponding parts to those previously described.

Figs. 28*a* and 28*b* show the shape of the sensing pins utilized in this embodiment. As indicated, the pins are rectangular with the ends tapered to a reduced section to insure that they enter the rectangular perforations in the card properly.

In this embodiment, it is only necessary that the interponent members, either in the interpreter basket 11 or the auxiliary basket 11*a*, be arranged to meet the substitutions from the desired column fields of the sensing pins 14. This may be done by minor adjustment or by inclination of the positions of the interponent wires in a manner which will be obvious. Accordingly, the sensing pins 14, which find perforations in the undesired columns, may pass therethrough, but do not meet interpreter wires to which to convey their substitutions. The sensing pins 14, which find perforations in the desired columns, then meet interpreter wires and transfer their substitutions thereto. The gags are set thereby and latched down by the latch plates 21. Upon operation of the die plate 24, the blank card, which has been conveyed to the punching chamber, is punched and, thereafter, ejected to the storage magazine.

As before, the newly punched card is the norm, and the setting of the gags may be regarded as the plane of conversion to the norm.

Translating 80 column to 90 column code

It is, in many instances, undesirable to discard any of the data from an 80 column card. Accordingly, the series of substitutions diagrammatically shown in Fig. 30, may be utilized for converting from 80 column to 90 column code. This series of substitutions and translations may conveniently be performed by the combination of members shown in Fig. 32. In this figure, a sensing head 75, as shown in Figs. 2, 5, 7, 9, 10, 11, 26, 28 and 30, is utilized. (Figure 32 shows a sensing head structure which is similar to that shown in Fig. 30, but in much greater detail, since it shows the presence-of-card sensing pin 86, the latch plates 17, etc.)

Similar card storage, transferring and receiving members are provided as before described.

The 80 column card is conveyed to the sensing chamber 16 and sensed by the pins 14. The pins

14, which find perforations in the card, pass therethrough and meet the upper ends of the translator members 147 in the auxiliary interpreter basket 11a. As indicated, these interpreter members are adapted to convert the one hole code of the 80 column card into the two hole code of the 90 column card. The 90 column card will, of course, receive and record all of the data recordable on an 80 column card, but, as will be obvious, the data must be distributed between the upper and lower fields of the 90 column card. This may conveniently be done by offsetting the translator members 147 in the basket 11a, as shown, the members from the different columns being offset one way or the other as desired. (It is, of course, possible to punch the same record from a single column in two fields in a 90 column card. However, this is seldom required.)

If the digit 1 is indicated by the usual perforation in the 80 column card, the fourth of the pins 14 from the left in Fig. 32, will find a perforation, pass therethrough, and depress the second from the left of the translator members 147, thereby depressing the second of the interpreter wires 146, setting the second of the gags 19 under the control of the latch plate 21, and punching a hole by means of the punch 24, if the perforation is to be recorded in the upper column. Alternately, if it is to be recorded in the lower column, the member 147 will be offset to to the right and will depress the eighth of the interpreter wires 146 to set the corresponding gags 19 and punch 24 to punch the appropriate hole in the lower field to indicate the digit 1. If, however, a hole is punched in the 80 column card to indicate the digit 2, the fifth of the sensing pins 14 will find the perforation and depress the third of the translator members 147. It will be noted that this member is attached to a "flag" 149, (shown more clearly in Fig. 32a) which has a slot cooperating with a pin on the second of the members 147, and which also cooperates with a second "flag" member 151, which is attached to the last member 147 toward the right. Therefore, when the fifth of the sensing pins 14 is depressed to indicate the digit 2, it depresses, in turn, the third member 149, which, being in contact with the flag member 151, carries it downward also. Simultaneously, the flag member 149, cooperating with the pin on the second interpreter wire, carries it downward to set the second of the gags 19. Simultaneously, the flag 151, being attached to the interpreter wire at the extreme right, carries down with it this particular interpreter wire, setting the sixth gag 19 in effective position. Accordingly, when the punch is operated, it makes two perforations in the card to indicate the digit 2 according to the 90 column code.

Similarly, a perforation indicating the digit 3, in the third level, in the 80 column code card, causes an actuation of the fourth of the members 147 by the sixth of the feeler pins 14 and a setting of a single one of the gags 19, for producing a perforation to indicate the digit 3 in the 90 column code, as will be obvious from the previous description of the method of punching for the digit 1.

Similarly, a perforation representing the digit 4 in the 80 column code causes the setting of two of the gags 19 to indicate the digit 4 according to the 90 column code, in a manner similar to that described for the digit 2.

It may be noted that in Fig. 32 the mechanism in the basket 11a, consisting of the members 147, 149 and 151, includes offset members for conveying the substitution movements sidewise, accordingly as they are to actuate gag members for punching in the upper or lower fields of the 90 column card. In Fig. 32, the unshaded members, indicated as offset to the left, cause the production of perforations in the upper field, whereas the shaded members, indicated as offset to the right, cause the production of perforations in the lower fields. The respective members, which are offset to the left and to the right, are indicated as cooperating with different columns in the 80 column card. They may be formed in such a manner as to convey the substitution movements to columns in the respective upper and lower fields, having the column axes aligned; or they may convey the substitution movements to columns in the 90 column field which have their axes parallel but displaced sidewise on the card (that is, considering the card in its 45 or single column or normal code aspect, the respective 90 column indicia may be positioned in the same normal code column or in different normal code columns). That is, adjacent columns of 80 column code may be positioned side by side in a 90 column field, alternate groups or fields from the 80 column card being put in upper or lower 90 column fields as desired, or the position of the respective columns and fields of the 80 column card may be readjusted and repositioned in the 90 column card to suit the exigencies of the particular problem, as will be obvious from the previous description.

It may be noted that, in the course of the sequence of substitutions, as described above, the sensing pins in operating on the 80 column card, in effect, substitute for it two 45 column code planes, which are not quite filled out, and that the two 45 column code planes are then translated to 90 column code and combined on a single 90 column card. Thus, the series of substitutions proceeds as before by way of the norm of the 45 column code, as it is shown in Fig. 31.

Translating 45 column to 90 column code

For translating 45 column code cards into 90 column code cards a similar structure may be used. For this purpose the previously described sensing head, having 80 columns, as shown in Fig. 28, is removed and replaced with the standard sensing head having 45 columns of sensing pins (including, of course, a card chamber 16 as a portion of the sensing head), as shown in Figs. 2, 5, 7, 9, 10 and 11. A similar interpreter basket 11a to that shown in Fig. 32 is used, but one having 45 columns of translator members 147 instead of 80 columns, and having the translator members offset to transfer for substitutions to upper and lower fields in a 90 column code card as desired. In the operation of this embodiment, an exactly similar sequence of operations to that described in connection with the translation of 80 column code cards to 90 column code cards takes place.

In this instance, however, the original code is the norm and the translation is made from the norm as the original to the desired new code.

Translating Tauschek code to 45 column code

A perforation code, which has been somewhat extensively used is that known as the Tauschek code. This is in effect a counting-point code, the digit 1 being represented by a single perforation in the 1 position, the digit 2 being represented by two perforations, respectively in the 1 and 2 po-

sitions; the digit 3 by three perforations, respectively in the 1, 2 and 3 positions, etc. This may be compared to the normal 45 column code, by the statement that it contains the appropriate perforations in the proper positions for the 45 column code and also additional perforations in the positions of the lower digits. To convert this code to the norm or 45 column code, it is required only that the substitution for the perforations corresponding to the lower digits be removed. This may be accomplished by the construction of the embodiment shown in Figs. 33 to 35, inclusive. Since this translation is essentially the removal of certain substitutions without further modification or interchange, it is not outlined in diagram of a substitution sequence of the type shown in Fig. 25.

Referring to Fig. 33, the punch members 24, gags 19, latch plate 21 and translator interponent baskets 11a and 11, are provided as before. Likewise, a card chamber 16, as in previously described embodiments, is provided. A special sensing pin basket 75 is provided, having sensing pins 14 of extra length therein. The sensing pins 14 are provided with latch plates 17 (see Fig. 34) and actuating mechanism as previously described and as shown diagrammatically in Fig. 32. The sensing pins have top extensions 152, as shown in Figs. 33, 34 and 35.

The sensing pin tops are notched as indicated and spring catch plate members 153 are provided, cooperating with the notches in the sensing pin tops. As shown in the drawings, the catch plate springs 153 are provided with cam portions 154 particularly as shown in Fig. 35, adapted to cooperate with the lower margins of the notches in the sensing pin tops 152. As shown in Fig. 34, each of the spring tongues in the spring plate is offset above the cam member 154 by an amount equal to the distance of separation of successive pins (for sensing successive digits in a single column). The springs are likewise provided with curved top catch members 155, as shown in detail in Fig. 35.

In the operation of this embodiment, the card perforated according to the Tauschek code may be inserted by the usual card conveying means in the sensing chamber 16. The sensing pins are lowered to the card, and, in terms of the 45 column code, the significant perforation is the one in the highest digit position. It will be noted that all of the pins 14, corresponding to the higher digit positions than this, are held up by the card, and the pin at the significant digit position and all the pins for lower digit positions find perforations and pass therethrough. However, in passing through, the significant digit pin drops downward and the notch passes below the cam portion 154, permitting the catch end of the spring to pass inward to the median plane of the pin column. This brings the upper end or catch member 155 into the notch 152 on the next lower pin and the pin is thereby prevented from descending more than a small amount, which, however, is sufficient to release its spring and catch the next lower pin, etc. The latch members 17 are provided with special clearance so that the pins 14 are not latched down in spite of this small amount of movement. Accordingly, only the one significant feeler pin 14 descends sufficiently to be latched down and to contact with the interponent wires in the baskets 11a and 11, and one only of the gags 19 is set. It is, of course, obvious that the spring member 153 is attached to a stationary plate above the sensing pin basket 75.

As before, the code of the first card is thus converted to the norm, and a second card perforated according to the requirements of that norm, which as above described is the normal 45 column code.

Translating Tauschek code to 90 column code

The previously described embodiment converts the Tauschek code to 45 column code. A simple modification of the system of Fig. 33 will permit a translation from Tauschek code to 90 column code. The translator basket 11a, shown in Fig. 33, need merely be replaced by translator basket 11a of the embodiment of Fig. 32. It may be noted that the plane of conversion to the norm or 45 column code may be located immediately below the card pocket 16 of Fig. 33, and that the substitutions produced in this plane are adapted to be transferred to translating interponent members similar to members 147 of Fig. 32, thereby translating the norm or 45 column code to 90 column code, which may be offset in a similar manner to that shown in Fig. 32 to insert the desired data in either upper or lower fields in the 90 column code card. In view of the simplicity of this modification of the showing of Fig. 33, it does not appear necessary to show it in a separate figure since the figure would differ from that of Fig. 32 only by the addition of the top extensions of the sensing pins 14 shown as 152 in Fig. 33, and by the addition of the springs 153.

By this means a translation is made from the Tauschek code via the normal or 45 column code to the 90 column code. Similarly, others of the subsequently described translator systems may be incorporated in the interponent system to produce still other embodiments adapted to other types of translation.

Translating 45 column to Lasker-Woodruff code

Another perforation code, which is frequently used, is known as the Lasker-Woodruff code. This perforation code, as most conveniently shown in British Patent No. 378,571 of 1929, requires two holes for each digit and uses six significant positions. The code is most conveniently produced by the use of a column of six punches and a movable slide thereupon having a series of projections as shown in the British patent, or in Fig. 36, the slide being movable into any one of ten positions. Thus, in the first or zero position, two of the projections meet the first and third punch heads and punch corresponding holes. For the 1 position, the slide is moved onward one step, the projections meet the second and fourth punch heads and punch holes accordingly. The digit 2 is represented by holes in the third and fifth positions, and the digit 3 by holes in the fourth and sixth positions. For 4 the slide moves one more step, but the first projection passes beyond the punch column field, and a third projection meets the first punch. Accordingly, for the digit 4, holes are punched in the first and fifth position. For 5 the slide moves still further and holes are punched in the first and second position; for 6 in the second and third position; for 7 in the third and fourth position, etc., to 9.

The arrangement of members in the machine of the invention as disclosed in Fig. 36 is adapted to the translation of 45 column code into the Lasker-Woodruff code. In this embodiment, the sensing pin basket 75, the sensing pins 14, the card chamber 16, and the card conveying rolls 79 (not shown in this figure) are provided as

before. An ordinary interponent basket 11a having merely straight normal interponent wires is also provided. A special punch system is provided as shown in Fig. 36, having only six punches in each column, but having the usual conveying rolls 61. A special interpreter basket 11 is also provided.

(It is, of course, obvious that it is more convenient and more satisfactory to provide a special punch, punch chamber and conveying rolls, as shown in Fig. 41, although, of course, the ordinary punch system may be used and only six of the usual punches arranged to be utilized.) It is also to be understood that a special card traversing means (not shown) is provided suitable for feeding cards of the size used for the Lasker-Woodruff code perforations.

The interpreter basket 11 is equipped with slides 156 having a single top button or stop 157 and the customary three projections 158 on the under side of the slide 156. The projections on the lower side of the slide cooperate with the heads of the gag members 159, which, in turn, operate the punch members 24. The upper stop member 157 on the upper side of the slide 156 cooperates with the interpreter wires 161 in the basket 11. Gear teeth are cut in the form of racks on the tops of the slides 156 as shown. These gear racks cooperate with gear teeth on the sectors 162. These sectors are carried on a shaft 163, mounted on the end cheeks of the basket 11, and springs 164, one for each sector and slide, are provided for drawing the sectors forward. A universal bail 165 is likewise provided cooperating with all of the sectors as shown, for returning the sectors and slides to the original position. The bail 165 is actuated by the pull rod 166, which, in turn, is operated by a cam 167 and lever 168, as shown.

In the operation of this embodiment, the usual 45 column code card is conveyed to the sensing chamber 16, the sensing head 75 actuated and one of the sensing pins 14 finds a perforation in the data column. Passing therethrough, it depresses the interponent wire in the basket 11a; for the substitution sequence as previously described; the interponent wire in the basket 11a, in turn depressing one of the interpreter wires 161 in the interpreter basket 11. When the sensing head 75 is fully depressed, the cam 167 releases the lever 168, the pull rod 166 rises, and the bail 165 permits the rotation of the slides 156, whereupon the springs 164 pull the respective sectors 162 around the shaft 163 and draw the slides 156 forward until the upper stop 157 strikes the lower end of the depressed translator wire 161, thus bringing the projections 158 in an appropriate location over the gags 159 to permit the punching of the appropriate holes according to the Lasker-Woodruff code, in substitution for the perforations according to the 45 column code, or norm, of the card in the sensing chamber.

After the bail 165 has been released and the slides permitted to travel until the stops meet the depressed interpreter wires in the several columns, the punch carriage is raised and the new card punched according to the indicated code. When the punching is completed, the cam 167 returns the lever 168, pull rod 166, and bail 165 to their original position, thereby restoring the slides 156 in preparation for the sensing and punching of another card.

It may be noted that this translation starts from the norm or 45 column card and proceeds to a translation into a different code as shown in Fig. 37. The plane of the norm or standard substitution may be regarded as located at the bottom of the interpreter wires 161 at the point where the projection 157 makes contact.

Multiple translations

The above described translations have been indicated as made by the production of a series of substitutions, which include a norm or 45 column code, but do not necessarily punch an actual card according to the 45 column code. However, the series of substitutions involving the various translations may, if desired, be conducted by way of the actual punching of a 45 column card, as shown in Fig. 38. For instance, given the data on a card punched according to the 80 column code, a translation therefrom to 45 column code may be made as above described and a 45 column card punched. This card may then be utilized for the translation of the data into another form such as the Lasker-Woodruff code on still another card by the device as above just disclosed. This system of translation may be convenient for the translation from one of the more complicated codes to another of the more complicated codes, and, obviously, may be varied to suit.

Translation from 90 column to Lasker-Woodruff code

The previously described embodiment of Fig. 36 is adapted to the translation from 45 column code to Lasker-Woodruff code and there has been previously described means for converting from 90 column to 45 column code. These two conversion systems may be used through the intermediary of a 45 column code card for the translation from 90 column to Lasker-Woodruff code as described in connection with Fig. 38. However, a much more satisfactory device for converting from 90 column code to Lasker-Woodruff code is shown in Figs. 39 and 40.

In the embodiment disclosed in those figures, the usual sensing head 75, adapted to operation with 90 column code cards, is provided, and cooperating therewith a non-converting interpreter basket 11a and an interpreter basket 11 adapted to convert the 90 column code substitution to 45 column code indications, which are then, in turn, translated to Lasker-Woodruff code by a device similar to that shown in Fig. 36.

Referring particularly to Fig. 39, the sensing head 75 contains sensing pins 14, which cooperate with the card chamber 16, and the interponent members in the interponent basket 11a. Below the interponent basket 11a is provided the special interpreter basket 11, which is shown in further detail in Fig. 40. Below the translator basket 11 is provided a special gag field 169, as well as a special punch basket and card traversing equipment 171, suitable for the size of cards used for the Lasker-Woodruff code.

Referring to Fig. 40, the translator basket 11 contains a series of columns of six interponent members 172, supported in frames near the top of the basket 11. Below the members 172 are positioned, also in frames and guides, a series of six interpreter members 173 to 178, inclusive. As indicated in the drawings, these translator interponents are differently shaped, according to the functions and position of each. Below the translator interponents 173 to 178, inclusive, are positioned the slides 179, each of which has an upper stop member 181, and a series of bottom projections 182 arranged according to the require-

ments of the Lasker-Woodruff code. The slides 179 have rack teeth formed on the upper edge as described in connection with Fig. 36, which mesh with sectors 162 mounted on a shaft 163 under the control of a spring 164 as described in connection with that figure. Likewise, a bail 165 operated by a pull rod 166 under the control of a cam 167 and lever 168 is provided. A similar punch gag field 169 is provided and similar punch members 24.

In the operation of the device of this embodiment, the interponent members 172 may be arranged to cooperate with either the upper or lower field in the 90 column card, which is fed into the sensing chamber 16 (Fig. 39). Upon arrival at sensing position, the 90 column card is sensed by the pins 14 and those pins which find perforations transfer their substitutions to the interponent in the basket 11a by movement thereof. These interponents, in turn, transfer their substitutions to the interpreter basket 11 by depressing the translator interponents 172. If zero is represented in the 90 column code, the first of the translator interponents 173 is depressed into the path of the stop member 181. Thereafter, the cam 167 permits the lever arm 168 to rise, freeing the sectors 162 from the bail 165 and allowing the slides 179 to move under the impulse of the spring 164. This movement is small, and, accordingly the right hand pair of projections 182 on the under side of the slide 179 engage with the first and third of the gage 169, thereby blocking the first and third of the punches 24 and punching the appropriate two holes for the zero indication.

If the digit 1 is represented in the 90 column code card, the second translator member 174 is depressed, but not the first. Accordingly, upon the freeing of the sectors 162, the slide 179 moves one unit further, bringing the first and second of the projections 182 over the second and fourth of the gags 169, thereafter punching the pair of holes for the digit, according to the Lasker-Woodruff code. When the digit 2 is represented, in the 90 column code, the first and sixth of the translator members 172 are depressed, thereby depressing the translator members 174 and 178. The depressing of member 178 releases the pin 178a from the shoulder of the plate which normally holds it, as indicated in the drawings, and permits the sequence, consisting of members 174 to 177, inclusive, to be moved by the shoulder on the slide 179 towards the right by an amount equal to one division, thereby permitting the slide 179 to move one division further than when the member 174 alone was depressed. In this way, the projections 182 are brought over the third and fifth of the gags 169 to punch the code for the digit 2. The method of returning the translator members 174 to 178, inclusive, will be described in connection with Fig. 44.

For the digit 3, the member 175 only is depressed, and the slide moves to position the members 182 over the fourth and sixth gags to punch the code for the digit 3.

Similarly, for the digit 4, members 175 and 178 are depressed and the slide 179 moves the indicated number of divisions, bringing the third of the projections 182 into play and carrying the first beyond the gag field, to punch the appropriate pair of perforations by means of the first and fifth punches.

Similarly, the depression of member 176 permits the slide 179 to move still another division further, bringing the third of the projections 182 over the first and second of the gags to punch the code for the digit 5. It may be noted that the sixth of the gags 169 has a portion of the head cut out and that the middle one of the projections 182 is narrower than the others. This is done to avoid the punching of an undesired third hole when the digit 5 is represented, and is possible because of the fact that the reduced width of the middle projection enters the notch produced by the cutting away of part of the head of the sixth gag as shown.

The code for the digits 6, 7 and 8 is punched in a similar manner as will be obvious from inspection of the figures. The 90 column code uses only a perforation at the nine point for the 9 digit, and accordingly only the member 178 is depressed for 9. This permits the slide 179 to make a full stroke until the stop 181 contacts with the lower end of the member 178, thereby bringing the left hand one of the three projections 182 over the two gags to the right, thus yielding the desired code perforations for the digit 9.

It may be noted that in the embodiment shown a zero or naught stop 173 is provided, but the 90 column code does not necessarily always use perforations for the naughts, since the tabulator head, with which the 90 column code cards are adapted to be used, may frequently contain automatic zero stops, which prevent movement of the sectors when no perforation occurs in a given column. The transfer system of the stop basket of such tabulators may conveniently be applied to the system of the present embodiment in a manner which will be obvious. Such automatic zero stops may be arranged to prevent the punching of any code in the new card or may be arranged to permit the punching of the zero code holes as desired.

Thus a similar series of substitutions and translations is produced to translate the code from the 90 column card to reproduce the same data in the Lasker-Woodruff code on another card, and, as before, the procedure involves the translation from one card to a norm or 45 column code and the translation from the norm to the desired code; the plane of the norm being the plane between the slide 179 and the translator members 173 to 178, inclusive.

Lasker-Woodruff code card equipment

As shown in the above mentioned British patent, the Lasker-Woodruff code card may conveniently be substantially smaller than the standard 45 column normal code card and, accordingly, a different type and size of card conveying mechanism is desirable for the punch system, as shown at the bottom of Fig. 39. The details of this modified construction will appear more fully from Fig. 41.

Referring particularly to Fig. 41, the changes, which are desirable for the handling of the smaller size Lasker-Woodruff cards, consist essentially of modifications in the contours and arrangements of parts, as well as reduction in size. As shown, a card magazine 254 is provided, which is of smaller size than the usual card magazines shown in Figs. 1, 2, 6 and 8. The magazines 254 consist of right and left members of which the right hand member only is shown in Fig. 41. Because of the reduced size of the cards, the loading and handling is facilitated by the angular position in which the cards are held, the stack being inclined from the normal vertical position by the sloping sides of the magazine members 254, as indicated.

At the bottom of the magazine is provided a picker knife 255, which is attached to a frame 256.

The frame 256 also has attached thereto a bottom plate 257. The frame 256 is carried on guide rods 258, which appear in the figure in the form of screw heads, the extended body of which forms the guide and carrying rods. The picker knife and its frame are moved by a lever 259, cooperating with a square member, which is journaled on a cross bar carried by the picker knife frame 256, as in previously described embodiments. The lever 259 is actuated by an eccentric strap member 261, cooperating with an eccentric on the shaft 262. A throat knife 263 is also provided at the forward edge of the card magazine. The throat knife is adjustable in a vertical direction by means of the threaded bar and nuts indicated.

Card conveying rolls 264 are provided as shown, mounted upon shafts as in the previously described embodiments.

Adjacent to the card conveying rolls 264, the punch members are positioned. These consist of a die member 265, a stripper plate 266, and punch members 267. The die plate 265 and stripper plate 266 form the punch chamber and are mounted on vertical guides for vertical reciprocation by means of the cam 268, as previously described, through the agency of the lever 269. The punches 267 pass through a guide plate 271, which is stationary in the punch frame, and the head members of the punches 267 are supported thereby against a downward pull from the stripper plate 266 at the completion of the punching operation. The punch members 267 correspond to the punches 24 as indicated in Figs. 36, 39 and 40, and are in general similar.

Upon the guide plate 271 is positioned another guide plate 272, and an intermediate guide plate 273. The upper and intermediate guide plates carry the special gags 169, as shown also in Figs. 39 and 40. As indicated, the gags 169 are made with enlarged head portions, which rest upon the upper surface of the plate 272, and with reduced diameter body portions, which pass through a locking plate 274. As indicated this plate is formed with double drilled keyhole slots such that the lower end of the gags can be inserted through the plate. Thereafter, when the plate is moved sidewise, the smaller portions of the holes are brought into register with the center lines of the gags to prevent withdrawal thereof.

Adjacent the punch chamber, formed of the guide plate 265 and stripper plate 266, are positioned the eject rolls 275, and the receiving magazine 276.

In certain installations, it is desirable that special perforations be included in the Lasker-Woodruff code card to indicate certain special data, particularly, when the card represents a sale, to show whether the sale is of a certain amount of bulk goods or is of a certain number of unit articles. These perforations are most conveniently obtained by means of the wires 277 and the associated punch gage members 278 as shown in Fig. 41. As indicated, these members, when actuated, move into the path of certain of the punch members 267 to cause the production of the desired special perforations. The wires 277 are operated by manually actuable levers (not shown), extending through the front frame of the machine.

This construction thus provides a simple, convenient, compact and efficient card handling mechanism for cards of the Lasker-Woodruff type.

Translating Lasker-Woodruff code to 45 column code

An embodiment in many ways similar to the embodiment of Figs. 39 and 40, which may be utilized for the translation of Lasker-Woodruff code to 45 column code is shown in Fig. 42.

In this embodiment, the usual card conveying members and sensing chamber 16 may be used as before, and the usual type of sensing head 75, which, however, need have but six sensing pins 14 in each column to cooperate with the six position Lasker-Woodruff code. Below the sensing chamber 16 is provided an ordinary interponent basket 11*a*, which also need have but six interponents in each column, although the standard basket with twelve interponents may be used if desired, since the extra interponents, while they serve no particular function, do not interfere with the operation of the device.

Below the interponent basket 11*a* is provided a special translating interpreter basket 11. Below the interpreter basket 11 is provided the usual gag field 19. The latch plates 21 of the previous embodiments may be omitted in this instance, since they serve no useful function, or they may merely be disabled. An auxiliary gag basket below the gags 19 may be utilized as shown, but it should contain no elevating springs of the type shown in other embodiments such as Fig. 30. The usual punch members 24 and card conveying rolls 61 are included in the embodiment as well as the usual card storage and receiving pockets. The card feed shown in Fig. 41 is used in connection with the sensing mechanism, as the Lasker-Woodruff cards require a special card feed mechanism.

The translator basket 11 contains a series of special slide members 183. The slides 183 cooperate with sector members 162 of the same type as that shown in Figs. 39 and 40. The sectors are mounted upon a shaft 163, and tension applied by springs 164. A bail member 165, pull rod 166, cam 167, and lever 168, are provided in general similar to those shown in Fig. 40.

The interpreter basket 11 contains interponent wires 184, which may be positioned in the normal vertical position or may be bent to interchange fields in any desired fashion as has been previously described. The slide members 183 each support a series of stop members 185, 186, 187 and 188, respectively, pivoted as shown, on pivoted levers 191, 192 and 193. The slides 183 likewise have bottom projections 194 which are adapted to cooperate with the tops of the gag members 19.

In the operation of this modification, if a zero is indicated in the column of the Lasker-Woodruff code card in the sensing chamber 16, the first and third of the sensing pins 14 will find perforations and depress the first and third of the interponents in the basket 11*a* and the first and third of the translator wires 184. When the wires have been fully depressed, the bail 165 is raised, releasing the sectors 162, which under the urge of the springs 164 draw the slides 183 to the right. The stop member 185, being free to move downward, will pass under the first of the wires 184, by swinging the lever 191 and raising the stop 186. However, when the stop 185 reaches the third of the wires 184 the stop 186 simultaneously strikes the first of the wires

184 and, since the two depressed wires just mentioned prevent the stops 185 and 186 from being raised, neither can be depressed to pass under the associated depressed translator wire. Accordingly, the slide 183 halts with the stops 185 and 186, respectively in contact with the first and third of the translator wires 184, thereby bringing the projection 194 over the third of the gags 19. When the punch member described is operated, all of the gags 19 are free to rise except the third, and, accordingly, the third pin will punch a hole in the new card in the zero position.

A similar action takes place for the digit 1, when the second and fourth of the interpreter wires 184 are depressed, to punch a hole in the new card, indicating the digit 1. Likewise, for the digit 2, the third and fifth of the wires 184 are depressed, and for the digit 3 the fourth and sixth of the wires 184 are depressed, each successive pair permitting the slide 183 to travel one step further over the gags 19.

For the digit 4 the wires 1 and 5 are depressed and, accordingly, two wires separated by a distance other than the distance of separation of the stops 185 and 186 are depressed. Accordingly, the slide 183 will not be halted by the stops 185 and 186 working together. However, the stop 186 and the stop 187 are separated by a distance equal to the distance of separation of the first and fifth of the wires 184, which accordingly will cooperate to stop the slide 183 with the projection 194 over the sixth gag 19 to punch the code hole for the digit 4 in the new card. The action which occurs in this instance is that the stop 185 passes under the depressed first translator wire 184, since none of the other three stops are under depressed wires. Immediately thereafter the stop 186 passes under the first wire 184 because the third wire beneath which the stop 185 is positioned at this time, is not depressed and the stop 185 is free to rise. Similarly, the stop 185 passes under the fifth wire, which is depressed, since the third is not depressed to catch the stop 186. However, when the stop 186 reaches the fifth wire, the stop 187 simultaneously reaches the first wire. Both being depressed, neither of the stops 186 and 187 can rise to permit the other to pass under the respective depressed wires, and accordingly the slide 183 is halted.

For the digit 6, the first and second of the wires 184 are depressed and accordingly the slide is not halted until the stops 187 and 188, which are separated by a distance equal to the distance of separation of the two depressed wires, reach the two wires. This sequence of steps continues for the remaining digits in the code.

When the appropriate single hole has been punched in the new card, the sensing head releases the depressed wires, which rise and thereafter the bail 165 is drawn downward by the cam, lever and link system shown to move the sector 162 and the slides 183 to their original positions, whereupon the respective cards are removed from the sensing and punching chambers and replaced by other cards.

Translating Lasker-Woodruff to 90 column code

For translating from Lasker-Woodruff to 90 column code the Lasker-Woodruff code may be translated to 45 column code and the card punched by the embodiment shown in Fig. 42, after which the 45 column card may be converted to a 90 column code card by the device of the embodiment shown in Fig. 32.

Alternatively, however, a system of members similar to the basket 11*a* of Fig. 32 may be inserted in place of the gag members 19 and the conversion produced directly from the 45 column code plane at the top of the gags 19 to the 90 column code at the punches. In view of the obviousness and simplicity of this conversion, the embodiment is not formally shown in a drawing.

It is to be understood that in both of the above mentioned cases where the basket 11*a* of Fig. 32 is employed, this basket is provided with 45 columns of translator members 147.

Translating Borel-Siemens-Halske code to 45 column code

The Borel-Siemens-Halske code is a typical four position multiple perforation code. This code may conveniently be translated to 45 column code by the embodiment of the device shown in Fig. 43. In this embodiment, the usual sensing head 75, with sensing pins 14 and the sensing chamber 16 is provided, as previously disclosed, but it need be equipped with only four sensing pins in each column.

Below the sensing chamber 16 is positioned a special interpreter basket 11*a*, below which, in turn, is positioned the usual translator basket 11, which may merely reproduce the fields or may reproduce any desired interchange of fields, as is well known in the art. The bottom ends of the wires in the translator basket 11 cooperate with the punch gags 19, each column of which is equipped with a special set of latch plates 21, as shown. The usual retract interponents 26 are provided, as shown, and also the usual punch basket and card traversing mechanism, as previously disclosed. The special translator basket 11*a* is equipped with a plurality of spaced wires, cooperating with floating levers, as shown.

In the operation of this embodiment, the digit 1 of the Borel code is represented by a single hole perforation at the first level or top of the four points in the column. Accordingly, when the digit 1 is sensed in the chamber 16 only the left hand one of the sensing pins 14 finds a perforation. The pin depresses the left hand translator wire 195, which, in turn, depresses the interponent in the basket 11 to depress the left hand one of the gags 19 (the eleven and twelve gags being omitted), which is latched down by the plate 21, and a perforation punched in the one position in the 45 column code.

The digit 2 is represented in the Borel code by a single perforation at the second level in the code column. Accordingly, when the digit 2 is sensed by the pins 14, the second pin finds the perforation, passes therethrough, depresses the second from the left of the wires 195, which, in turn, depresses the second of the translator wires in the basket 11 to depress the second of the gags 19, which likewise is latched down by the upper of the slides 21 to punch a perforation in the 2 position on the 45 column code card.

The digit 3 is represented in the Borel-Siemens-Halske code by two perforations, respectively in the first and second levels in the column. Accordingly, when the digit 3 is sensed, the first and second from the left of the pins 14 in the Fig. 46 are depressed simultaneously, thereby depressing both the first and second from the left of the wires 195, the first and second of the translator wires in the basket 11 and the first and second

of the gags 19. However, the floating lever 196 is likewise depressed at both ends and carries with it the wires 197, which depresses the third from the left in the basket 11, and the third gag from the left. This gag cannot be latched by the upper one of the slides 21, but is latched by the middle slide 21, and in so doing a pin on the third gag cooperates with a cam slot in the top slide 21 to displace it so that neither the first nor the second from the left of the gags 19 can be latched down by the top slide 21. Accordingly, a perforation is punched in the 3 position only in the 45 column code.

Similarly, the digit 4 in the Borel-Siemens-Halske code is represented by a single perforation at the third level, and accordingly the third from the left of the sensing pins 14 will find the perforation when the digit four is sensed to depress the third of the wires 195, which, in turn, depresses the fourth of the translator wires in the basket 11, and the fourth of the gags 19, which is latched down as shown by the top slide 21, to permit the punching of a hole in the four position of the 45 column code.

The digit 5 is represented in the Borel-Siemens-Halske code by perforations in the first and third levels and accordingly when the code for the digit 5 is sensed by the pins 14, the first and third of the pins find perforations and depress the first and third of the wires 195, which, in turn, carry down with them both ends of the floating lever 198, which, in turn, depresses a wire 198*a* and thereby the fifth of the translator wires in the basket 11 and the fifth of the gags 19. Simultaneously, however, the first and fourth of the wires in the basket 11 and gags 19 are also depressed. Accordingly, the fifth gag is latched down by the middle one of the slides 21, and a cam pin thereon acting on a cam slot in the upper of the slides 21 displaces it to prevent the latching down of the first and fourth gags. Accordingly, only a perforation in the 5 position is punched in the 45 column code.

Similarly, the digit 6 in this code is represented by two perforations, respectively in the second and third levels. Accordingly, the second and third of the pins 14 find perforations, pass therethrough, and depress the second and third of the wires 195. These wires depress the appropriate wires in the basket 11 as shown and the second and fourth of the gags 19, and, simultaneously, depress both ends of the floating lever 199 to depress a wire 199*a* and thereby the sixth of the translator wires in the basket 11, and the sixth of the gags 19. This sixth gag likewise is latched down by the second of the slides 21 and a cam pin thereon likewise cooperates with a camming slot, which disables the uppermost of the slides 21 to prevent the latching down of the first and fourth of the gags 19. Accordingly, a hole is punched in the sixth position of the 45 column code card.

The digit 7 is represented in the code under consideration by three perforations in the first, second and third levels, and, accordingly, when the digit 7 is sensed by the pins 14, the first, second and third of the pins find perforations, pass therethrough and depress the first, second and third of the wires 195, thereby depressing directly also the first, second and fourth of the wires at the bottom of the basket 11 and the gags 19, thereunder, depressing also the third of the wires in the basket bottom and the gags thereunder through the floating lever 196, the fifth of the wires and the gags thereunder through the floating lever 198, and the sixth of the wires and gag thereunder through the floating lever 199. Simultaneously, however, both ends of the floating lever 201 are carried downward, the right hand end by means of the third of the wires 195, and the left hand by means of the wire connected to the floating lever 196, leading to the third position in the 45 column code. The lever 201 being depressed, depresses also the wire connected thereto leading to the seventh position, thereby depressing the seventh of the wires in the basket 11, and the seventh of the gags 19. Since the first, second and third of the wires 195 have depressed the first, second and fourth gags, the slide 21 must be disabled to prevent punching of undesired holes, which is done by a pin on the seventh gag cooperating with a cam slot in the slide 21. Similarly the third, fifth and sixth of the wires and gags have been depressed, by their respective floating levers, so the second of the slides 21 must be disabled to prevent punching in such positions. This is accomplished by a second pin on the seventh gag 19 cooperating with a cam slot on the second of the slides 21, and the seventh gag is latched down by the lowermost of the slides 21, thereby punching a perforation only in the seventh position of the 45 column code.

The 8 digit is represented by a single hole in the fourth position of the Borel-Siemens-Halske code and the method of translation and punching will be obvious from the drawings.

The 9 digit is represented in the Borel-Siemens-Halske code by perforations in the first and fourth positions, and the method of translation for the 9 digit will also be obvious from the drawings and the preceding explanation.

Thus the Borel-Siemens-Halske code is translated to the 45 column norm and, accordingly, in a manner generally similar to those previously described.

Translating Borel-Siemens-Halske code to 90 column code

The translation of Borel-Siemens-Halske code to 90 column code may be accomplished by the device as shown in Figs. 44, 45, and 46. In this embodiment, as before, the usual sensing basket 75, sensing pins 14, and sensing chamber 16 are provided with but four sensing pins 14 to each column, if desired. A translator basket 11*a* is provided, containing translator wires 195 as in the embodiment of Fig. 46 and also a similar system of floating levers 196 to 201, inclusive. A special translator basket 11 is also provided and the usual system of gag members 19, latching slides 21 and retract interponents 26, as shown. The special translator basket 11*a* is provided with intermediate columns of special interponents 202, as shown in greater detail in Figs. 45 and 46.

As shown, these consist of interponent wires 202, each having a wedge shaped projection 203 and a loosely surrounding, wedge shaped jacket member 204. The function of these members will be apparent when the method of operation is described. The basket 11 is equipped with the interponent and "flag" system for translating from 45 column to 90 column, as shown, and as described in connection with Fig. 32. It may be mentioned here that neither in the construction shown in Fig. 43 or Fig. 44 are zero perforations punched in the cards.

In the operation of this embodiment, the digit 1 is represented in the Borel-Siemens-Halske

code by a single hole in the top level of the column. Accordingly, the first from the left of the sensing pins 14 finds a perforation, passes therethrough, and depresses the first of the wires 195 to depress, in turn, the first of the interponents 202, and the first of the translator members 147, which, in turn, depresses the first of the gags 19 in the upper or lower field, according as the translator members are offset to the right or left, thereby punching the appropriate single hole for the digit 1.

The digit 2 is represented in this code by a single perforation in the second level. Accordingly, when the digit 2 is sensed, the second of the pins 14 finds a perforation, passes therethrough, and depresses the second of the wires 195, thereby depressing the second of the interponent members 147 to carry downward the flag 149. The flag 149, cooperating with the indicated pin upon the first of the members 147, carries it downward to set the first of the gags 19 in its field. Simultaneously, the "flag" 149 acts with the "flag" 151, thereby carrying down the last of the interponent members 147 to set the gag in the lowest or nine position in its respective field, thereby indicating the digit 2. Simultaneously, the movement of the second of the interponents 202 causes its wedge member 203 to cooperate with the jacket member 204 on the first of the interponents 202, causing it to move sidewise by an amount sufficient to displace the upper end of the first of the interponents 202 from under the lower end of the first of the wires 195.

In the case of the digit 2, this displacing action is not significant.

For the digit 3, the Borel-Siemens-Halske code provides perforations in the first and second positions, which are found by the first and second of the sensing pins 14, which pass therethrough and depress the first and second of the translator wires 195. These carry with them the floating lever 196 and depress the wire 197. Thus the first, second and third of the interponents 202 are depressed. However, the depression of the third of the interponent wires 202 causes its wedge member 203 to co-act with the jacket wedge 204 on the second of the members 202, thereby displacing it sidewise and simultaneously displacing sidewise the first and second of the wires 202, and freeing them from the first and second of the wires 195. Accordingly, only the third of the members 147 is depressed to depress the second of the gags 19 in the chosen field.

Similarly, the digit 4 is represented by a single hole in the third level of the Borel-Siemens-Halske code, and, when the digit 4 is sensed, the third of the wires 195 is depressed, carrying down the fourth of the interponents 202, displacing the first, second and third thereof sidewise from under their respective translator wires, depressing only the fourth of the translator members 147, to punch the appropriate holes in the second and ninth positions for the digit 4 in the 90 column code.

Similarly, the digit 5 in this code is represented by perforations in the first and third positions. Accordingly, when this digit is sensed by the pins 14, the first, and third of the wires 195 are depressed, carrying with them the levers 198 and depressing the fifth of the interponent members 202, thereby displacing sidewise the preceding four of the interponents 202 and depressing only the fifth of the members 147, to set a gag 19 in the third position for the perforation of the single hole for the digit 5, according to the 90 column code.

The remaining digits are sensed in a similar manner to that described in connection with Fig. 43 and the Borel-Siemens-Halske code is converted to the norm or 45 column code, at the plane of the bottom ends of the interponent members 202, by a series of translating substitutions. Thereafter, the 45 column code is converted to a 90 column code by a second series of translating substitutions.

This embodiment demonstrates as clearly as any the method of utilizing translating substitutions to convert from a complicated code to the norm, and from the norm to another complicated code.

General translating systems

The system of wires and floating levers described in Figs. 43 and 44 is applicable to the general case of the translation of any multihole code into the 45 hole or normal code or into the 90 column code. For instance, a number of codes have been proposed by workers in the art, such as the Peirce 4-unit code of Patent No. 1,245,500; the 4-unit code of Peirce Patent No. 1,219,765; the 4-unit code of Peirce Patent No. 1,260,706; the 4-unit code of Peirce Patent No. 1,506,383; the 4-unit code of Peirce Patent No. 1,741,201; the 4-unit code of Peirce Patent No. 1,236,475; the 4-unit codes of Goldberg Patents Nos. 1,761,662 and 1,818,473. These codes may all be translated to other codes by means of the embodiments of the device of this invention similar to that disclosed in Figs. 46 and 47 by modifications of the translator wires and of the floating levers, which will be obvious.

Similarly, a number of five unit codes have been proposed such as that of the Peirce Patent No. 1,316,461 and the Goldberg Patent No. 1,716,662. These codes likewise are readily translatable into 45 column or normal code, or into 90 column code by modification of the structure of Figs. 46 and 47, which will be obvious in the light of the description of those figures, since it requires merely the addition of other translator wires and floating levers.

The general case for such translations is shown diagrammatically in Fig. 47. Given four units of a code, sixteen combinations are possible, starting with the first combination as none of the spaces perforated or none of the wires depressed, etc., and continuing with the various combinations indicated in the figure. As will be evident from the various figures, any desired arrangement of code elements can be made to indicate any desired digit merely by choice of the way in which the wires are bent, and by proper position of the floating levers. All of the wires can be put into two planes, regardless of the point to which they are extended. Accordingly, any desired four unit or five unit code can be translated to the same type of normal code such as the 45 column code, from which any other translation can be made.

Another translating system, which may be regarded as another form of the general case is shown in Fig. 48. In this figure, the plurality of slides A, B, C and D are provided upon which are mounted a plurality of discs as shown, the discs on all but the top slides being provided with center slots which cooperate with flattened pins as indicated to allow the discs a considerable amount of sidewise movement relatively to the

bars, but to limit the relative movement in a direction parallel to the length of the bars. Likewise, a series of digital pins P—1, P—2, etc., to P—16 are provided as shown. Appropriate movements of the slides A, B and C can then be utilized to block or depress any single one of the pins, P, and no more than one pin is blocked or depressed in any possible combination setting of the slides A, B, C and D.

The slides are to be positioned at one or the other of their paths of travel, although, for the sake of symmetry all are shown in mid positions.

As will be obvious, when all four slides are moved to the left, pin P—1 will be blocked or depressed. If slide D alone is moved to the right, pin P—2 will be blocked or depressed. If slide C is moved to the right, pin P—3 or P—4 will be blocked or depressed according to the position of slide D.

As will be obvious, the position of slide A will determine whether the right or left hand half of the field of the pins P is chosen. Similarly the position of slide B will determine whether the right or left hand half of the half field of pins selected by slide A is selected. Similarly slide C may select the right or left hand half of the quarter field of pins selected by slides A and B.

The general case embodiments of Figs. 47 and 48 provide means for translation from a complex code to a simple code, which is the equivalent of the 45 column norm previously discussed, since only a single pin is depressed or a single movement controlled from the code indications. The principal and essential difference is to be found in the fact that the two embodiments adapted to the general case complete the translation of the code providing a translation into a single element of each of the sixteen possibilities in the code.

Alternative translations from Lasker-Woodruff to 45 column code

The theory upon which the structure of Figs. 43, 44 and 47 is based may be utilized in the construction of an alternative system for translating from the Lasker-Woodruff to normal code as shown in Fig. 49. The Lasker-Woodruff code uses two perforations for each digit, and uses no single hole code elements, and no three or more hole element combinations.

In this embodiment the usual sensing head 75, feeler pins 14, sensing chamber 16, and interponent basket 11*a*, may be used as indicated. The translator basket 11 is equipped with six translator wires 205, which, as shown, extend from the upper face of the basket 11 to meet the interponents from the bottom face of the basket 11*a*, but do not extend to or through the lower face of the basket 11.

The lower face of the basket 11 contains the usual ten interponent wires, each wire being connected to the mid point or pivot of one of the floating levers 206, and each of the floating levers 206 being pivoted to two of the wires 205 as indicated. The choice of wires connected to the respective floating levers is set by the character of the Lasker-Woodruff code as indicated.

The method of operation is, in general, similar to the method of operation previously disclosed, the Lasker-Woodruff code card being sensed in the chamber 16, by the pins 14, which transfer their substitutions through the basket 11*a* to the wires 11, which being depressed in pairs, will depress, in turn, the appropriate sensing wires to depress the gags 19, which are latched by the latch plates 21, after which the new card is punched as previously described.

Thus the same system of translations to a norm is conducted as previously outlined.

Alternative translation from 45 column to Lasker-Woodruff code

As previously noted, each digit is represented in the Lasker-Woodruff code by two perforations. Accordingly, a simple translation from 45 column code to Lasker-Woodruff code is obtainable by an embodiment illustrated in Fig. 50, in which the usual sensing basket 75 is provided with feeler pins 14, and sensing chamber 16. The feeler pins which find perforations, transfer the substitutions to the interponents in the auxiliary basket 11*a*, from which they are transferred to the wires 207 in the basket 11 as shown. The wires 207 have attached thereto the respective flags 208, each flag being adapted to cooperate with the appropriate pair of the wires 209. Accordingly, the substitutions, transferred to the single wires 207, are translated by the flags 208 to substitutions consisting of the depression of pairs of wires 209, which, in turn, depress the gags 19, which are latched by the latch plates 21, and cause the appropriate punching of the code card.

In this embodiment the translation is thus from a norm or 45 column code or to a more complicated code, specifically the Lasker-Woodruff code.

Translation to complementary punchings

The operation of subtraction by an adding machine is most conveniently performed by the addition of complementals, (and the provision for the so-called "fugitive 1"). Accordingly, instances arise in which it is desirable to convert the digital data on the card into the numerical complements of the indicated digits. Such a translation is conveniently obtainable by the embodiments of Figs. 51 to 54, inclusive.

In the embodiment of Fig. 51, which is adapted to the translation of 45 column code digits to the complementals, the usual sensing head 75 is provided in which are mounted the usual sensing pins 14, cooperating with the sensing chamber 16, as in previously described embodiments. Card traversing and conveying rolls 79 are also provided as well as the various sensing head automatic mechanisms previously described. The sensing pins 14 cooperate with the interponents in the usual secondary interponent basket 11*a*.

The usual type of punch mechanism is also provided and includes a punch plate or die 23 and punch members 24, which are actuated by gags 19 under the control of latch plates 21. The usual card conveying rolls 61 and retract interponents 26 are provided as in previously described embodiments.

The interponent basket 11 is provided with special translator wires 243, which, as indicated, are arranged so that substitutions received in the zero position at the top of the basket are conveyed to the 9 position at the bottom; from the 1 position at the top to the 8 position at the bottom; from the 2 position at the top to the 7 position at the bottom, etc., until substitutions in the 9 position at the top are conveyed to the zero position at the bottom. This produces the appropriate complement conversions.

There is also required means for inserting the fugitive 1. When a tabulator is adapted to subtraction by means of complementals, it is also provided with means for tripping the tens carry-

ing device in the units column in the adding sectors. This member ordinarily is inoperative, since there are ordinarily no tens to be carried to the units. Accordingly, a special trip wire is provided in the tabulator, which is adapted to be operated by a special perforation on the card. This perforation may be placed in any convenient location, according to the arrangement of the data, in the card columns, although the usual place is in the units column of the complemental field. In translating from normal digits to complementals the required special hole for tripping the tens carrying member in the units column may be inserted by the device which is shown in further detail in Figs. 53 and 54.

In Fig. 53, a section of the punch mechanism of the translating machine is shown, which is, in general, similar to that of Fig. 6, to which has been added means for inserting a special perforation as disclosed in my co-pending application, Serial No. 588,863, filed Jan. 26, 1932.

As shown, this consists of a member **244**, which may be provided in only one column or may be provided in more than one column (see Fig. 56), depending upon the number of complemental fields. As shown in particular detail in Fig. 54, this member consists of a C-shaped piece adapted to enclose partially the auxiliary gag basket **245**. The member has a bottom projection **246** and a series of bottom depressions for a click spring **247**. These depressions cooperate with a comb spring **247** to hold the C-shaped piece in position. The comb spring **247** is carried upon a cross rail **248**, which is attached to the frame of the machine as indicated.

In the operation of this embodiment, the complemental translator basket **11**, as described, is inserted between the sensing head and the punch mechanism previously described, and the gag block member **244** moved forward to the appropriate place in the appropriate column to block the desired punch for the production of the required special hole.

The original or master card is then conveyed to the sensing chamber **16**, sensed by the pins **14**, one of which finds a perforation and depresses an interponent in the basket **11***a*. This, in turn, depresses one of the translating interponents **243**, which conveys the substitutions as previously described to a complemental position at the bottom of the basket **11** to depress the complemental gag **19**, which is latched down by the plate **21**. Thereafter movement of the punch chamber causes the perforation of the card with the appropriate hole in the complemental position and also the necessary auxiliary hole produced by a punch which is blocked by the projection **246** as will be obvious.

It may be noted that this translation is from one type of norm to another type of norm.

Translating 90 column code to 90 column complemental code

For the translation from 90 column code to 90 column complemental code, the embodiment of Fig. 52 may be utilized. This is in general similar to the embodiment disclosed in Fig. 51 and previously described for the translation of 45 column code to complemental, except for the difference in translator basket required by the difference in code.

It may be noted that the 90 column code does not utilize perforations to indicate zero, the zeros being left unperforated, and, accordingly, in the conversion to the complementals for subtraction, means must be provided for inserting the appropriate perforation to indicate the complemental nine on the complemental or subtraction card, whenever there is no perforation in the original card. This arrangement is also required on account of the operation of the automatic zero stops in the tabulator mechanism through which the cards may subsequently be run, for otherwise it would be necessary to disable the zero stops in the complemental or subtraction fields.

Also the complement of the digit 1, which is represented by a single hole in the ordinary 90 column code must be represented in the complemental code for subtraction by the indicia of the digit 8, that is, two perforations respectively in the lowest and next lowest levels of the field column. Likewise, the digit 2 is represented in the usual 90 column code by two perforations, whereas the complemental for subtraction must be represented by the single perforation of the ordinary 7 digit, that is, one perforation in the next to the lowest level in the field column. The other digits are represented by complementals in a manner, which will be obvious, each single code hole having for its complemental a two hole indicia and each two hole indicia having a single hole indicia except the 9, which, having zero for its complement, preferably is represented by no perforations in the complemental card.

The requirements of the code conversion as above outlined are conveniently met by the arrangement shown in Fig. 52, in which the basket **11** contains the interchanging interponent wires, and a reversing lever and special interponent wire between the respective bottom level positions of the respective code column fields.

In the construction of the translating interponent members **249** in the basket **11**, of Fig. 52, the translator wire leading to the second level of the code field on the upper face of the basket, that is, the wire movable in response to the indicia for the digit 1 is led to the next to the lowest level in the code column in the lower face, to the position of the indicia representing the digit 7 in the normal code. Similarly, the translator wire from the third level in the upper face, actuatable in response to indicia for the digit 3 is led to the third from the bottom level in the code column field at the lower face. Likewise, the wire from the fourth level in the upper face is led to the third level in the lower face and from the fifth level in the upper face to the second level in the lower face of the interponent basket **11**. In addition, the translating interponent wire **251** is led from the bottom level at the top face to the bottom level in the lower face through the intermedium of a reversing lever member **252** as shown.

As indicated, this arrangement of translator wires is provided for both upper and lower fields, if subtraction in both fields is desired. Alternatively, the wires **247** may be conveyed from a lower field in one card to an upper field in another card and vice versa. Also the position of the complemental fields may be varied in location on the new card with respect to the location on the original card in any desired manner as will be obvious from the previous description. likewise, the complemental conversion may be produced in certain only of the fields or may be produced simultaneously with a non-translating or non-converting reproduction of the record from the ordinary card in other fields, causing the new card both to add and subtract the same data in different fields.

Likewise a member 244, in general similar to the member 244, shown and described in connection with Fig. 51, may be provided for blocking the appropriate gag to produce the perforation which releases the tens carrying member in the units column, and introduces the fugitive one as previously described when the cards are run through a tabulator. The member 244 may be similar to that shown in Fig. 51, or it may be provided with an extended portion adapted to block a gag in the lower field as indicated by the dotted lines, if such is desired. Alternatively, a special perforation in an upper field may be utilized to operate the tabulator trip wire for a lower field if such is convenient.

In the operation of this embodiment, an original card or master card may be conveyed by the rolls 79 to the sensing chamber 16 and sensed by the pins 14. One or more of the pins in a given column may find a perforation, pass therethrough, and depress the interponent in the basket 11*a*. In the event that none of the pins 14 find perforations, as would be the case when zero or naught was indicated in the column, the spring 253 forces down the lower portion of the 9 position translating member to set a gag 19 in the 9 position, which gag is locked down by the slide 21 and the appropriate perforation produced by a punch 24 in the 9 position, to be complemental to the zero or naught.

If the digit 1 is represented in the original card the pins 14 find a perforation in the one position and depress the appropriate sequence of interponents to set a gag 19 in the seven position. Seven, however, is not the complement of one. But, simultaneously, the pin 14 in the 9 position does not find a perforation, and, accordingly, the spring 253 depresses the bottom of the 9 position wire and sets a gag 19 in the 9 positon, as well, thus indicating the digit 8, which is the proper complement of the digit 1.

Similarly, if a digit 2 is indicated in the original card, the pins 14 in the 1 and in the 9 position find perforations and depress interponent members for the appropriate substitutions. As before, depression of the interponents in the 1 position sets a gag in the 7 position. However, depression of the top of the translator wire 249 in the 9 position moves the levers 252 and elevates the bottom of the translator member 249 in the 9 position to prevent the setting of a gag 19 in the 9 position, thus producing the appropriate code perforations for 7, which is the proper complement for 2.

Other digits in the code column are translated by a similar sequence of operations, which will be obvious from an inspection of the drawings.

Fig. 52 shows the complemental translations as being made between similarly positioned fields on the master and copy cards. If desired, it is, of course, convenient to interchange the position of the translator wires to transfer the complemental translations from an upper field in the master card to a lower field in the copy card, or vice versa, or to transfer the relative positions sidewise or sidewise and crosswise of the copy card.

In addition, by the use of Y-wires in a manner which will be obvious in the light of the prior art, a single field of usual code in the master card may be reproduced in two fields in the copy card, one of the fields being in the usual code to represent the usual numbers, the other being translated into the complementals as above described. Thus the translation may be conducted in certain fields and not in others, according to the requirements of the particular record problem.

It may be noted that in this instance it is more convenient to make the translation directly from one complex code to another complex code without passing through the 45 column norm.

It may be noted that to remove this interponent basket 11, as described in connection with Figs. 12, 13 and 14, the nine wire 249 must be withdrawn. This is most conveniently obtained by an auxiliary bail within the basket which is arranged to rotate all of the levers 252 to withdraw the respective ends of the wires to the level of the remaining wires in order that no interference may be occasioned with the gags and auxiliary interponent basket 11*a*.

Reduced perforation spacing

In the operation of tabulating machinery, it has been customary to equip certain of the tabulator sectors with letter type, rather than number type, in order to record in letters or words some of the coded data on cards. The use of such alphabetical sectors with the 45 column code cards is shown in my co-pending application Ser. No. 576,992, filed Nov. 24, 1931. Likewise, the 90 column code may conveniently be used for alphabetical printings in similar manner to that shown in my co-pending application Ser. No. 674,820, filed June 8, 1933.

Various other codes have been used for alphabetical recordings, such as shown, for instance, in my copending application, S. N. 616,927, filed June 13, 1932, for Addressing machines, now Patent No. 2,027,916, issued January 14, 1936. In this application there is disclosed a perforated card in which a series of fields of five unit code are used for recording alphabetical data, together with 45 column code for the recording of numerical data. The perforations in the alphabetical code are much more closely spaced than has been the practice with the standard codes, and this spacing may, if desired, be applied to other code cards such as the Lasker-Woodruff, the 90 column code and others elsewhere described, and, when so applied, permits the recording of more data in a given space than is possible with the usual perforation spacing. Accordingly, the sensing head and punch members of the device of this invention may be modified in their spacing to co-act with cards having the suggested reduced spacing.

Alphabetical translations

In my above mentioned co-pending application S. N. 616,927, there is disclosed a tabulator card system using a five position code of perforations for the recording of alphabetic characters, which code is in general similar to the telegraphic five unit code. A translation from this code to that representing the alphabetic characters as shown in my co-pending application Ser. No. 576,992, or to the 90 column code representing alphabetic characters, may be obtained by the embodiment of the device of this invention, as shown in Fig. 55.

Broadly, this embodiment utilizes a double sensing procedure, which is applied through the agency of a series of perforated slides, which slides are controlled by the card code perforations.

In detail, as is shown in the Fig. 58, the usual sensing head 75 with feeler pins 14 cooperating with a sensing chamber 16 is provided as in previous embodiments, together with card conveying rolls 79. As indicated, less than the usual num-

ber of sensing pins 14 may be utilized for the five perforation code; five pins per column only need be provided.

Below the sensing chamber 16 and the sensing pins 14 there are provided a series of interponent wires 281, which are bent and passed through a guide plate 282. The interponent wires 281 are mounted within an interponent basket 11a, which is adapted to be interchangeable with the previously described auxiliary interponent basket 11a. The guide plate 282 is also attached to the basket frame. Upon the bottom plate 283 of the basket 11a are provided a series of five slides 284 as shown. These slides are arranged to cooperate with the lower ends of the interponent wires 281 and are moved toward those wires by a series of comb springs 285 and are retracted against the pressure of the springs by a lever member 286, which is operated by a cam 287 on the shaft 54. Above the slides 284 is positioned a second feeler pin basket 288, in which are carried a series of feeler pins 289. Underneath the plate 283 of the basket 11a is positioned the usual interponent basket 11. In the present embodiment, this is indicated as containing merely simple straight interponent wires, but obviously other types of baskets for translating or interchanging of various fields may be utilized.

The sensing head 75 is attached to the levers 74, cooperating with the cams 73, and similar levers and cams are provided for the operation of the sensing basket 288. These levers are not shown but are mounted upon the same shafts. A set of slides 284 is provided for each column of feeler pins, and the slides are perforated with holes according to the requirements of the translating problem.

In the operation of this embodiment the master or original card is conveyed from the magazine 42 to the sensing chamber 16 by the rolls 79. When the frame 75 is depressed, certain of the pins 14 find the perforations in the card and pass therethrough to depress certain of the wires 281. The lower ends of these wires are thus brought downward into the path of the ends of the slides 284. When the wires 281 are fully depressed, the lever 286 is released by its cam 287, and the slides allowed to move under the impulse of the springs 285. Accordingly, some of the slides are allowed to move under such of the wires 281 as are not depressed, whereas such of the wires as are depressed prevent movement of the corresponding slides. Accordingly, the register of the holes in the slides is adjusted according to the reading of the code column upon the card. When the slides 284 are fully released, the pin basket 288 is depressed to permit the pins 289 to find aligned holes in the set of slides 284. Such of the pins 289 as find holes in the slides, pass therethrough, and depress interponents in the basket 11, to set gags in the base member 12 as previously described.

It may be noted that latch plates are unnecessary in the basket 288, since the springs 291 may be made sufficiently strong to set the gags directly. This is possible because of the fact that the slides 284, being made of metal, will resist the required heavier spring pressure, which is not possible with the cards in the sensing chamber 16.

The alphabetic code for 45 column cards utilizes eleven of the perforations for the first eleven letters of the alphabet, and utilizes the same eleven hole positions plus a perforation in the twelfth position for the remainder of the alphabet; as outlined in the above mentioned co-pending application. Accordingly, the slides 284 are perforated to permit one or two of the pins 289 to pass therethrough, according to the various settings of the interponent wires 281 as determined by the five perforation code in the cards.

Thus a translation is conducted to the 45 column norm as previously outlined.

Translation from five-unit to 90 column codes

The same embodiment may be utilized for the translation from five-unit code to 90 column code by change of perforations in the slides 284. This arrangement of perforations will be obvious to those skilled in the art and need not be herein disclosed in detail. As before, the resulting translation may be distributed to upper or lower 90 column fields as desired by arrangement of the wires in the interponent basket 11.

It will be obvious that the embodiment of Fig. 55 may be utilized for substantially any desired translation within a single column, since the arrangement of the perforations in the slides in the auxiliary translating basket 11a may be varied to suit any desired code. That is, this embodiment will translate between any desired multi-perforation code and any other desired multi-perforation or single perforation code, and vice versa. Likewise, by the use of appropriate sensing members, cards of any desired size may be translated to the standard Powers tabulator card, either in the 45 column form or the 90 column form, or to other forms of code cards. Similarly, by the addition of appropriate conveying members, as shown in the respective references disclosing the code, any desired code on any form of tape, ribbon, card, etc., may be translated to any other desired form of card, ribbon, or tape. Or, if desired, the previously disclosed printing interpreter may be utilized to print upon cards, tape or other receiving material the data indicated by any given code.

It may be noted that this is the most flexible of the several translating systems disclosed herein.

General case

The system of Fig. 55 may be utilized as a general case by the arrangement as shown in Fig. 56, in which the sensing pin basket 75, sensing pin 14 and sensing chamber 16 are provided as before. Similar interponent wires 281 are provided in a suitable interponent basket passing through a guide 282 as before. Slides 291 are provided under the control of the lever 286, and springs 285 as in the embodiment of Fig. 58. A sensing pin basket 288 containing sensing pins 289 is likewise provided. The sensing box 75 and the sensing basket 288 are reciprocated in the same manner as those in Fig. 58. In this instance 32 sensing pins 289 may be provided to take care of the 32 possible combinations from the five-unit code, and the slides 291 may be arranged in the usual manner of the standard Borel - Siemens - Halske code analyzer. Interponent wires 292 are provided in an appropriate interponent frame 293 as indicated. The wires 292 may be arranged for any desired interchange, conversion or translation, which may be appropriate or desired according to the principles previously outlined. For instance, by appropriate flags and Y-wires as previously disclosed the substitution conveyed by the pins 289 through the slides 291 to the wires 292 may be translated to other substitutions according to other codes, as may be desired, or may be conveyed directly to a tabulator.

Auxiliary keyboard

Certain translation problems make it desirable to add to the newly produced card certain additional data which may be substantially uniform over a considerable run of copied cards. This may comprise such data as dates, or identifying numbers of various kinds, especially in the case of translations from 45 or 80 column cards to 90 column cards, as previously described. In such translation instances, the 90 column card has various unused fields in which such additional data may be placed. For this purpose the type of translating basket shown in Fig. 57 may be utilized. This translating basket member may contain any of the previously described translating systems and in addition the auxiliary digital setting members indicated.

As shown in Fig. 57, a suitable base plate **381**, having the usual pinch latch members **102**, may be provided, to which is attached the frame portion **383**, and the top plate member **384**, in which are positioned the usual translating wires, extending between the top and bottom of the basket, for any desired type of translation. In addition, the basket contains a series of plate members **385** as shown. The plate member **385** has at its forward end a series of metal strips **386**, forming digital setting tabs adapted to manual manipulation by the operator. As indicated, the strip members **386** are carried upon pins or rivets loosely mounted in slots in the plate member **385**. To cooperate with the tab members **386** there is provided a series of push rod members **387**, bell crank lever members **388** and depressor members **389** as indicated. Below the depressor members **389** is provided a series of interponent members **391**, adapted to cooperate with the gags or set-bars **19** of the punch member **12**. As indicated the push rods **387** are carried on pins or rivets freely slidable in slots in the plate **385**, and on the ends of the bell crank levers **388**. The levers **388** are journaled upon pins between the plate **385** and the auxiliary plate **392** as indicated, and the depressor members **389** are carried between the other ends of the bell crank levers **388** and a guide plate member **393**. As indicated, the interponent members **391** are positioned between the guide plates **394** and are held at the upper limit of travel by the springs shown.

The device as indicated is designed for operation according to the 90 column code; a code which requires the punching of a hole in the 9 position for each of the even digits. In order to provide for the setting of the appropriate gag or set-bar 19 for the even digits, the metal strip or tab **386** operating the depressor in the 9 position has attached thereto a plate member or flag **395**, which cooperates with a series of pin members **396** on the tabs for the even numbered digits.

In the operation of this device, the translator basket is inserted in the slides **95** of Figs. 2 and 13, and at the same time, the lock slide release interponents **26** of the punch member **12**, as shown in Figs. 2, 3 and 4, are turned down to prevent clearing of the set-up on the appropriate set-bars **19**. The operator may then push in the appropriate tab to set the desired digit in the appropriate column, which procedure depresses the members **391** and the desired set-bars for the punching of the appropriate digital perforations. As previously explained, and indicated, the setting of another set-bar releases a previously depressed set-bar, thus permitting the simple changing of the setting on the set-bars merely by manipulation of the desired tabs.

In the embodiment shown, the device is adapted for the insertion of additional or auxiliary data according to the 90 column code in an upper field of the card. Alternatively, of course, the device may be modified for the insertion of the desired data in a lower field and equally obviously the device may readily be modified for the setting of the desired auxiliary data in a 45 column card in ways which will be obvious.

As before, a simple sequence of substitutions is utilized for the insertion of the desired data at the appropriate position on the card.

Consolidating translator

Certain accounting problems, such, for instance, as chain shoe store accounting, require the perforation of cards in which the numbers of goods of certain sizes of a given pattern are indicated on separate cards, separate cards being punched for each size, showing the style number, size, quantity, and such other data as may be desired. For certain of the accounting problems, it is desirable that the total number of a given style, regardless of sizes, be shown on a single card for accumulation in the tabulator. For this purpose the translating or consolidating interpreter shown in Fig. 59 is conveniently utilized to transfer data recorded in any one of a number of fields to a single field.

The mechanism consists of a base member **94** closely similar to that of the translating interpreter shown in Fig. 12; a main frame member **11**, also similar and the usual pinch latch members **102**, not shown. Within the frame **11** and projecting through the top plate **455** are provided translator wires **456**, in the usual manner. The drawings show a section through the translating interpreter, at, for instance, the second level, in all of the 45 columns. It further shows a series of 15 three-column fields, each field being adapted to record three digits, which may be a size number or other desired insignia. Below the interponent wires **456** are provided a series of three transverse bar members **457**, **458** and **459**, which are carried upon bell crank levers **461**, as shown. The other ends of the bell crank levers are tied together by tie rod members **460**. This construction provides a parallel motion effect for the cross bars **457**, **458** and **459**. All of the interponent wires **456** for a given digit in the hundreds column of each of the fifteen fields contact with and operate the cross bar **457**. Similarly, the corresponding wires in the tens-column cooperate with the cross bar **458** and the corresponding bars in the units column, cooperating with the bars **459**. There is provided one bar similar to **457** for each perforable position in any hundreds column, the same number corresponding to **458**, and the same number corresponding to **459**. The number of bars in each of the three sets may be either ten or twelve, depending upon whether the required data is punched in 45 or 90 column code. Below the respective bars in any field level are provided three interponent wires **462** corresponding to the hundreds, tens and units columns in a single field. Thus the hundreds column wire **462** is depressed by movement of the bar **457** for the corresponding digit level in response to depression of any wire **456** in the corresponding digit level of the hundreds column in any of the fifteen fields. The tens wire **462** is similarly depressed under corresponding conditions in the tens column; the units wire **462** by

corresponding conditions in the units column, thus a record in any one of the fifteen fields in a card can be transferred as a similar record into a single field without regard to the field position in the original card.

It is not, of course, necessary that the fifteen three-column fields be combined into a single three-column field on the reproduced card. Any number of fields, within the capacity of the card, may be transposed to the desired point, and, if the number of fields being transposed is less than the capacity of the card to be copied, other data may be transferred either unchanged or modified in form, character or position, by any of the previously described translating systems.

Alternative translator basket mounting

The translator member **11** as shown in Fig. 12 is adapted to be removed from the punch mechanism and to be replaced by another. For this purpose, the mechanism shown in Fig. 13 may be utilized.

Alternatively, however, the mechanism shown in Fig. 60 may be utilized for the production of certain auxiliary benefits and operating conveniences in the punch mechanism. Slides **95**, similar to those shown in Fig. 13, may be utilized for the carrying of the translating basket **11**. These slides are mounted upon studs **481** as particularly shown in Fig. 61. The guides **95** are prevented from rising above the tops of the studs **481** by screws **482** set therein. The slides **95** are urged upward by springs **483** (only one shown) and push rods **484** mounted in the base of the punch mechanism. The slides **95** are forced downward by toggle lever systems **485** upon opposite sides of the machine. The toggle levers are actuated by links **486** and the upper ends of the toggles are anchored to the frame **39**. The links **486** are moved by levers **487** mounted upon a shaft **488**, which is rotated by a lever **489** having a finger pad suitable for manual operation. Stop members **490** are provided on each side of the basket cooperating with each of the toggle members **485** to prevent overthrow of the toggle levers and to hold the guides **95** in position.

For the removal of a translator basket, the lever **489** may be moved upward, thereby, through the mechanism just described, carrying upward the slides **95**. The latch members **102** are then pulled toward the center, whereafter the translator basket may be drawn forward and removed. A replacement basket may then be inserted in the slides and pressed backward, until the latch members **102** engage, whereafter the lever member **489** may be depressed to bring the translator basket into proper position.

Interlock

It is desirable that the punch mechanism be prevented from operating when a translator basket is in raised position on the guides **95** and accordingly an interlock mechanism is provided. This consists of a rod member **492** having a pin **491** at its upper end adapted to cooperate with a bell crank lever **493** to which the auxiliary trip button **494** is connected. The link member **495** connecting the trip button **28** to the clutch mechanism is attached to the other end of the bell crank lever **493**. Accordingly, when the slide **95** is in raised position, the pin **491** engages the lever **493** and prevents operation of either of the trip buttons **28** or **494**, thereby preventing operation of the punch.

Alternative trip mechanism

The trip mechanism for controlling the operation of the machine is shown in substantial detail in Figs. 17 and 18. An alternative form of trip mechanism is shown in Fig. 62 for the actuation of the clutch member **48** of Fig. 17. In this embodiment the same stop lever **115** is utilized with a cushioning spring system thereunder as shown. The lever **115** is carried upon a T-shaped member **501**, in general similar to the member **116** of Figs. 17 and 18, the lever **501** being supported upon a foundation plate member **513**. The lever **115** cooperates with the stop member **47** on the clutch **48** in a manner similar to that previously described. The T-lever **501** is pivoted upon a screw member **502** and carries upon the shank an operating pin **503**, upon which is pivoted a spring pressed lever **504** and pin **505**. A spring tensioned latch member **506** is pivoted upon a pin **507** also supported in the plate **513** and adapted to cooperate with the pin **503** to hold it in position such as to withdraw the stop member **115** from the path of the member **47** on the clutch disk **48**. The pull wire **509** is suitably connected between the latch member **506** and the various automatic safety features previously described such as the supply magazine feeler pins **124** and **128** shown in Fig. 17.

The latch member **506** has a side extension upon which is pivoted a push rod member **511** having a pin member **512** mounted thereon. A rod member **117** is connected to the trip button **28** and carries on its lower end a swinging operating member **514** having notches in the opposite sides and a biasing spring **515** tending to draw it towards the left.

In the operation of this device, pressure upon the trip button **28** or upon the alternative trip button **494** depresses the rod **117** causing the left-hand notch in the member **514** to engage with the pin **503**, thereby swinging the lever member **501** clockwise and withdrawing the latch member **115** from the path of the clutch member **47**, thereby causing the clutch to engage and the punch to begin operating. When the pressure upon the button **28** is released, the rod **117** rises and the member **514** is drawn upward. Simultaneously, it is thrown to the left by the spring pressure acting through the lever **504**, and the pin **505**. At the point of maximum travel of the member **514**, the pin **503** is depressed to bring it under the latch portion of the member **506** and accordingly upon withdrawal of the member **514** it is held in released position.

Actuation of any of the automatic safety features operates the latch member **506**, drawing it to the right, freeing the pin **503** and permitting the latch member **115** to enter the path of travel of the member **47** on the clutch plate **48**, throwing out the clutch and stopping the machine.

Alternatively, a second pressure upon the button **28** depresses the rod **117** and, since the member **514** is pushed towards the right by the pin **505** on the spring pressed lever **504**, causes the right-hand notch upon the member **514** to engage the pin **512** upon the rod **511**, thereby also rotating the latch member **506** to free the pin **503** entering the latch member **115** in the path of travel of the clutch member **47** to stop the clutch and halt the operation of the machine.

This embodiment is somewhat more effective and somewhat more certain in its operation than the embodiment shown in Figs. 17 and 18 and only slightly more complicated.

Interponent release

In Fig. 60 the gag member or set bars 19 are held down by latch plates 21 similar to those shown diagrammatically in Fig. 3, and are disengaged by the action of the interponents 26, (as shown also in Fig. 3), through the agency of a release bar 31. A convenient means for actuating the bar 31 of Fig. 61 is shown in further detail in Fig. 62 in which a lever member 521 having an attached push rod 522 is shown for the actuation of the shaft 145 and bar 31 (see Fig. 20). The cam member 144 upon the shaft 49, as shown in Fig. 20, cooperates with the roller member 523 carried upon a swinging arm 524 to which is attached a pin member 525. The lever 522 is swung into or out of engagement with the pin 525 by a lever member 526 which is latched in a notch in the frame of the machine as shown. This construction is substantially simpler and more certain in its operation than the embodiment of Fig. 20.

The system of this invention thus provides means for translating from code to code, either for the production of a new card carrying the identical information from an old card in a different code, or carrying similar or corresponding or analogous information modified in various ways, or both modified and translated; or for the translation of data from a card directly to a tabulator operable upon a different code, or for the production of a card in a different code than the code in which the punch control mechanism is designed to operate.

While there are above disclosed a considerable number of embodiments of the device of this invention, it is possible to produce still other embodiments utilizing the principles laid down without departure from the inventive concept herein disclosed, and it is, therefore, desired that only such limitations shall be imposed upon the appended claims as are stated therein or required by the prior art.

I claim:

1. A translator mechanism comprising a frame member having oppositely positioned parallel faces, and movable members projecting therethrough, the members of one face being adapted to be moved in accordance with code indications and the members projecting from another face being adapted to move and to move other members in accordance with code indications, and a mechanism therein for code translation comprising members extending from alternate members on one face to adjacent members on the other face, and short members interposed between said first mentioned members having thereon flag members adapted to cooperate with said first mentioned members, and simultaneously to cooperate with a flag member upon another of the through members.

2. A translator mechanism comprising a frame member having oppositely positioned parallel faces, and movable members projecting therethrough, the members of one face being adapted to be moved in accordance with code indications and the members projecting from another face being adapted to move and to move other members in accordance with code indications, and a mechanism therein for code translation comprising a plurality of members extending from face to face of said frame adapted to be operated by members coacting with single projections at one face and to operate a plurality of members at another face, and mechanism cooperating therewith comprising pins and latching slides for holding in moved position one or the other of the plurality of members moved according as another member is, or is not, moved.

3. A translating punch mechanism comprising a card sensing mechanism, a card punching mechanism, a removable translating interponent member comprising a plurality of wires extending therethrough adapted to receive sensing movements from a plurality of pins, and to deliver punch control movements to a different plurality of pins cooperating with said punch mechanism, and pin members and locking slides in said punch mechanism adapted to limit the locking of pins to a single pin according to the digit indicated by the code sensed from the card.

4. In combination, means for sensing a card, means for conveying movements corresponding to sensing from said card to a translating mechanism, said translating mechanism comprising an interchangeable frame member having members adapted to be moved downward to projecting position therebelow, a cross slide adapted to cooperate with downward projected members having a stop mechanism on the upper portion, and having a blocking member adapted to cooperate with punch mechanism upon an opposite edge, and a punch mechanism adapted to be controlled thereby.

5. A card controlled translating punch for statistical cards comprising means for sensing a control card having a plurality of index point positions arranged in rows and columns and carrying data in an initial code, mechanism for translating the sensed data from the initial code which data is indicated by perforations at certain of said index point positions to represent symbols such as digits and letters of the alphabet into an end code, a punch for producing another card carrying the same data in said end code, and means for detachably mounting said translating mechanism between the sensing means and the punch whereby said mechanism may be removed and replaced by a similar translating mechanism having different symbol intercode translating characteristics.

6. A card controlled translating punch comprising means for sensing a control card carrying data in an initial code, a plurality of translating units for translating the sensed data from the initial code into an end code, a punch for producing another card carrying the data in said end code, and means for detachably mounting said translating units between the sensing means and the punch whereby said units may be removed and replaced by similar translating units having different intercode translating characteristics.

7. A card controlled translating punch, comprising means for sensing a control card carrying data in an initial code, mechanism for translating the sensed data from the initial code into a norm or standard code and from this code into a predetermined end code, a punch for producing another card carrying the data in said end code, and means for detachably mounting said translating mechanism between the sensing means and the punch whereby said mechanism may be removed and replaced by a similar translating mechanism having different intercode translating characteristics.

8. A card controlled translating punch comprising means for sensing a control card carrying data in an initial code, mechanism for translating the sensed data from the initial code into a norm or forty-five-column code and from this

code into a predetermined end code, a punch for producing another card carrying the data in said end code, and means for detachably mounting said translating mechanism between the sensing means and the punch whereby said mechanism may be removed and replaced by a similar translating mechanism having different intercode translating characteristics.

9. A card controlled translating punch comprising means for sensing a control card carrying data in an initial code, a plurality of translating units for translating the sensed data from the initial code to a norm or standard code and from this code into a predetermined end code, a punch for producing another card carrying the data in said end code, and means for detachably mounting said translating units between the sensing means and the punch whereby said units may be removed and replaced by similar units having different intercode translating characteristics.

10. A card controlled translating punch comprising means for sensing a control card carrying data in an initial code, mechanism for translating the sensed data from the initial code into an intermediate code, punch gags actuable in accordance with the data in said intermediate code, a punch actuable in accordance with the setting of the gags for producing another card carrying the data in said end code, and means for detachably mounting said translating mechanism between the sensing means and the punch whereby said mechanism may be removed and replaced by a similar translating mechanism having different intercode translating characteristics.

11. A card controlled translating punch comprising means for sensing a control card carrying data in an initial code, a plurality of translating units for successively translating the sensed data from the initial code into a norm or standard code and from this code into a predetermined end code, a punch for producing another card carrying the data in said end code, and means for detachably mounting said translating units between the sensing means and the punch whereby said units may be removed and replaced by other units having different intercode translating characteristics.

12. A card controlled translating punch comprising means for sensing a control card carrying data in an initial code, mechanism for successively translating the sensed data from the initial code into a norm or standard code card, from this code into a predetermined end code, a punch for producing another card carrying the data in said end code, and means for detachably mounting said translating mechanism between the sensing means and the punch whereby said mechanism may be removed and replaced by a similar translating mechanism having different intercode translating characteristics.

13. A card controlled translating punch comprising sensing mechanism, a punch spaced from said sensing mechanism, and a plurality of mechanically interconnected translating units detachably mounted in the space between the sensing mechanism and the punch, one of said units being operatively associated with the sensing mechanism and another with the punch.

14. A card controlled translating punch comprising sensing mechanism, a punch spaced from the sensing mechanism, a plurality of translating units, means for detachably mounting said units in the space between the sensing mechanism and the punch whereby one of said units is operatively associated with the sensing mechanism, another is operatively associated with the punch and the units are mechanically interconnected with one another.

15. A translating unit comprising a basket having columns of interpreter wires slidably mounted in an upper plate and having the extreme interpreter wires in each half column extending through openings in a bottom plate, interponents also extending through openings in the bottom plate, said interponents being coupled together in pairs and each of the remaining interpreter wires being operatively associated with one of the coupled pairs of interponents.

16. The combination of a first translating unit having a first and a second set of interpreter wires, interconnections between the wires of the two sets whereby the actuation of a wire in the first set actuates a significant wire and other wires in the second set, interponents individual to the wires of the second set, means for preventing the actuation of any interponent except the significant interponent, a second translator unit having a plurality of interpreter interponents and interconnections therebetween whereby the actuation of an odd digit interponent actuates a single interpreter interponent and the actuation of an even digit interponent actuates two interpreter interponents.

17. A translating unit comprising a basket having a first set of interpreter wires extending through openings in an upper plate and having certain of said wires extending through openings in a bottom plate, a second set of interpreter wires certain of which also extend through openings in said bottom plate, and interconnections between the wires of the two sets whereby the depression of certain of the interpreter wires of the first set depresses the ends of these wires extending below the bottom plate and the depression of the remaining wires of the first set depresses the ends of the wires of the second set extending below the bottom plate.

18. In a card controlled translating punch, the combination of a plurality of mechanically interconnected translating units one of which is adapted to translate from an initial code into an intermediate code.

19. In a card controlled translating punch, the combination of a plurality of mechanically interconnected translating units one of which is adapted to translate from an initial code into a norm or standard code, and another of which is adapted to translate from the norm or standard code into a predetermined end code.

20. In a card controlled translating punch, the combination of a plurality of mechanically interconnected translating units one of which is adapted to translate from an initial code into a predetermined end code.

WILLIAM W. LASKER.

CERTIFICATE OF CORRECTION.

Patent No. 2,108,681. February 15, 1938.

WILLIAM W. LASKER.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 3, first column, line 24, for the reference numeral "81" read 80; page 8, first column, line 63, after "or" second occurrence, insert the words as previously stated; page 16, first column, line 32, for "gage 169" read gags 169; page 17, first column, line 65, for "gage" read gag; page 20, second column, line 45, for "Figs. 46 and 47" read Figs. 43 and 44; page 23, second column, line 71, for "Fig. 58" read Fig. 55; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 6th day of September, A. D. 1938.

Henry Van Arsdale

(Seal) Acting Commissioner of Patents.