

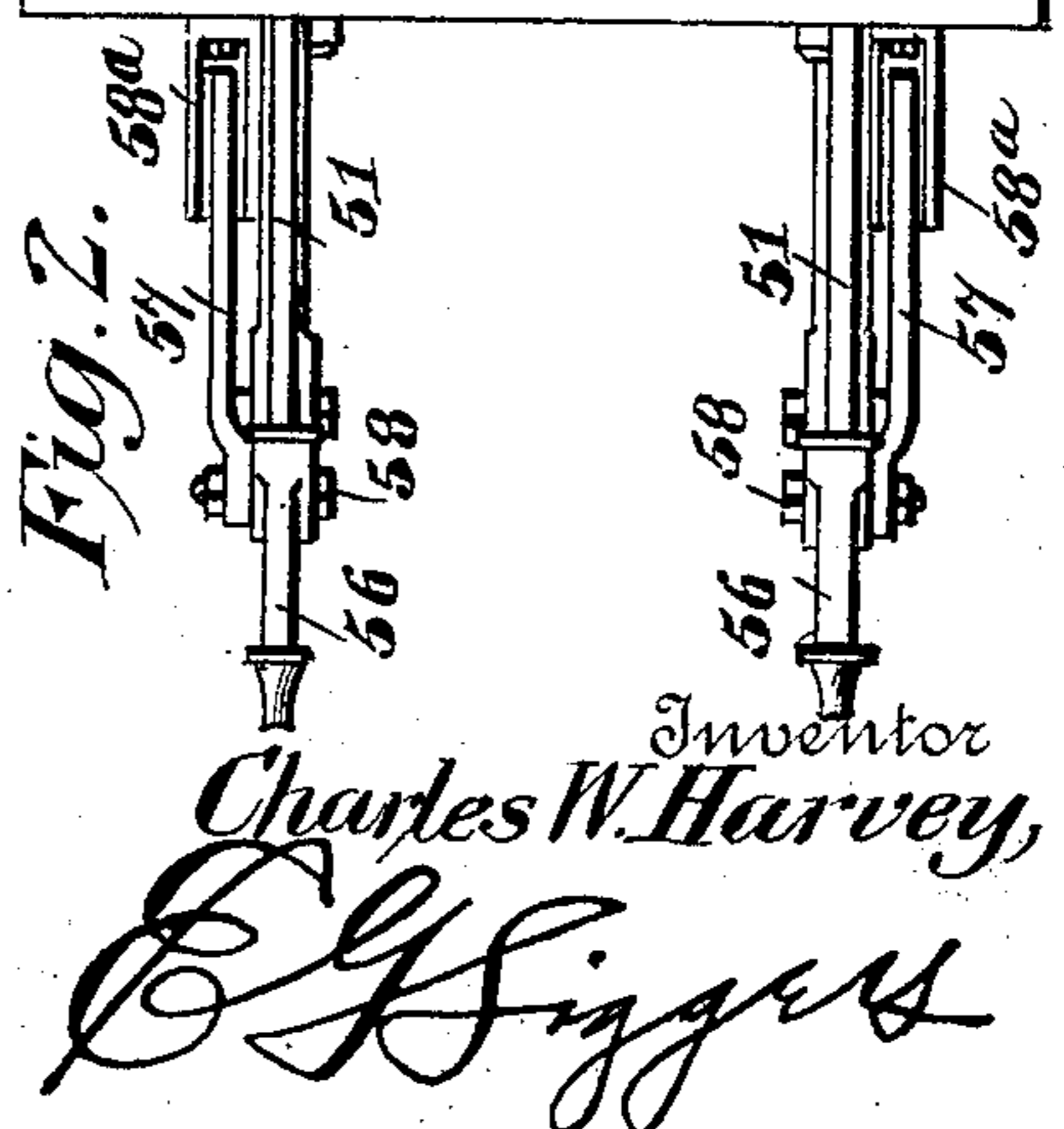
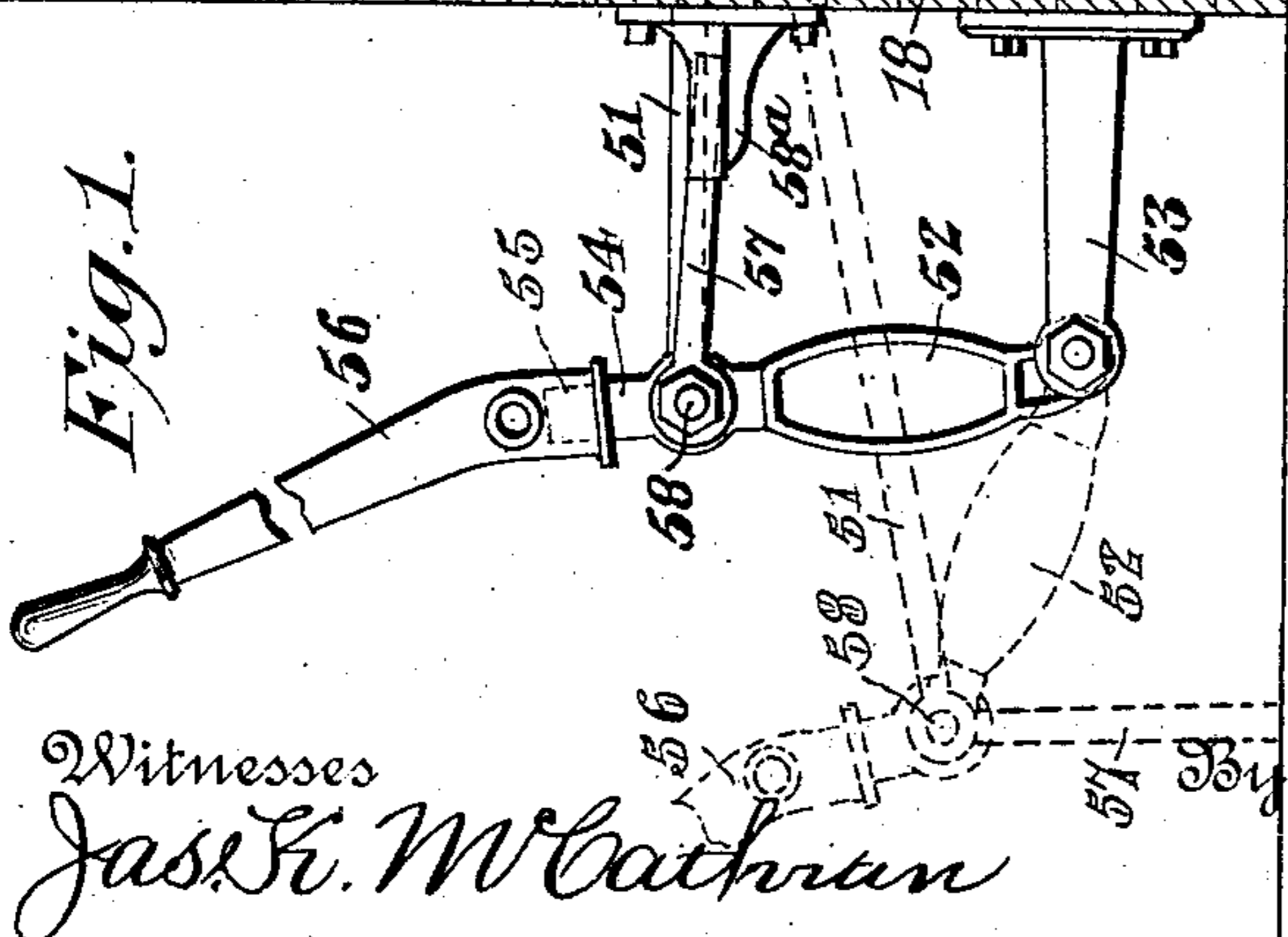
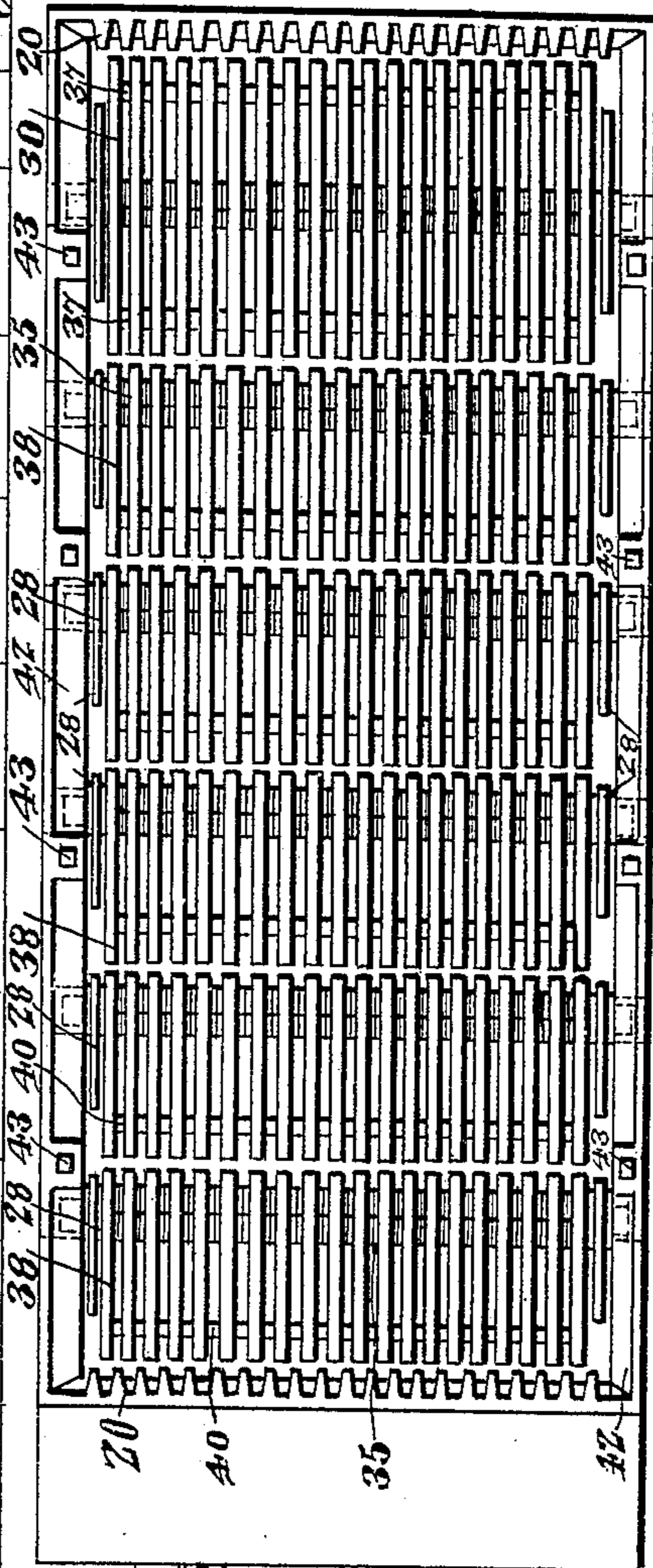
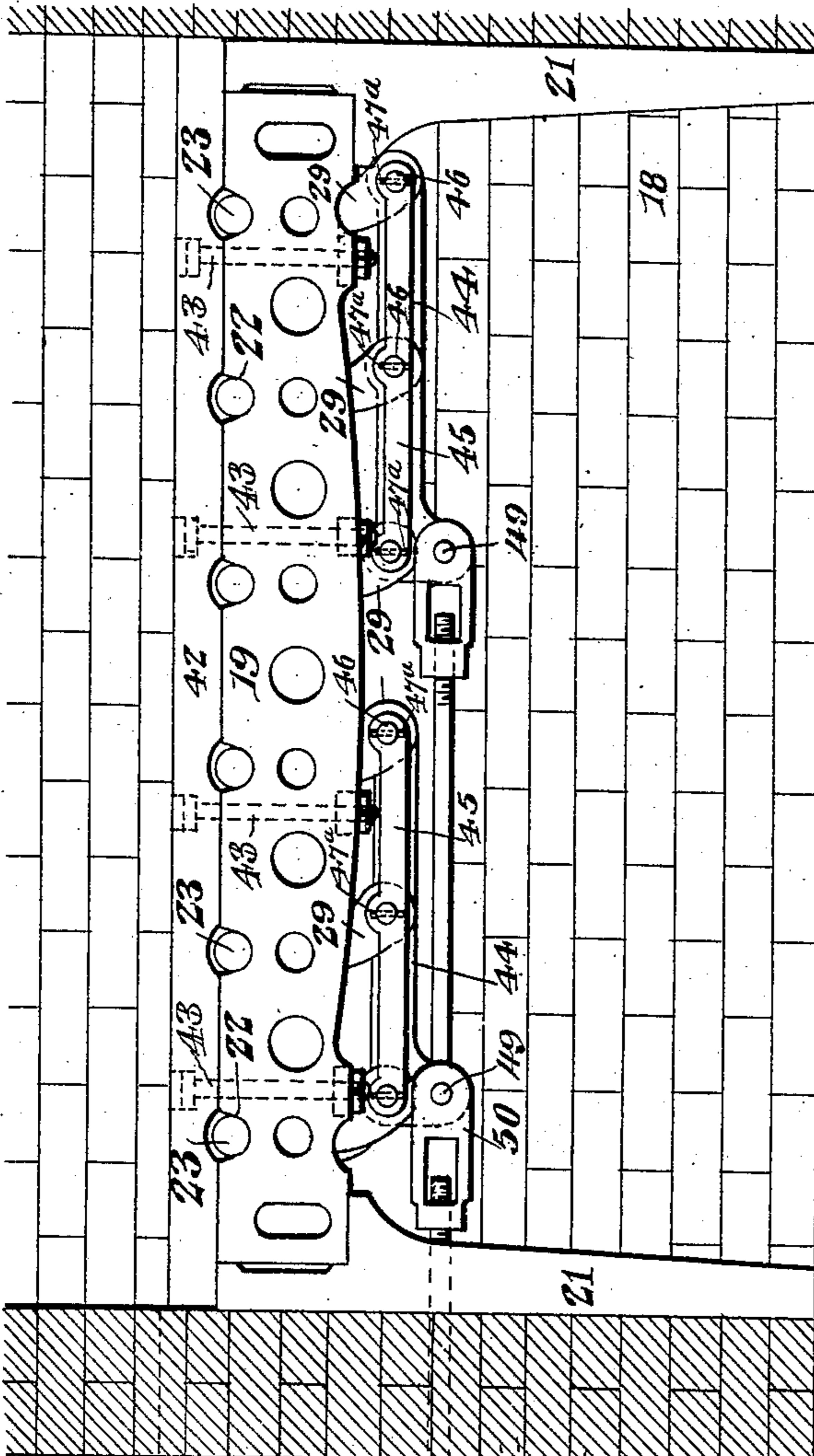
C. W. HARVEY.  
GRATE.

APPLICATION FILED SEPT. 7, 1906.

Patented Apr. 13, 1909.

3 SHEETS—SHEET 1.

918,317.



Witnesses  
Jas. E. McArthur  
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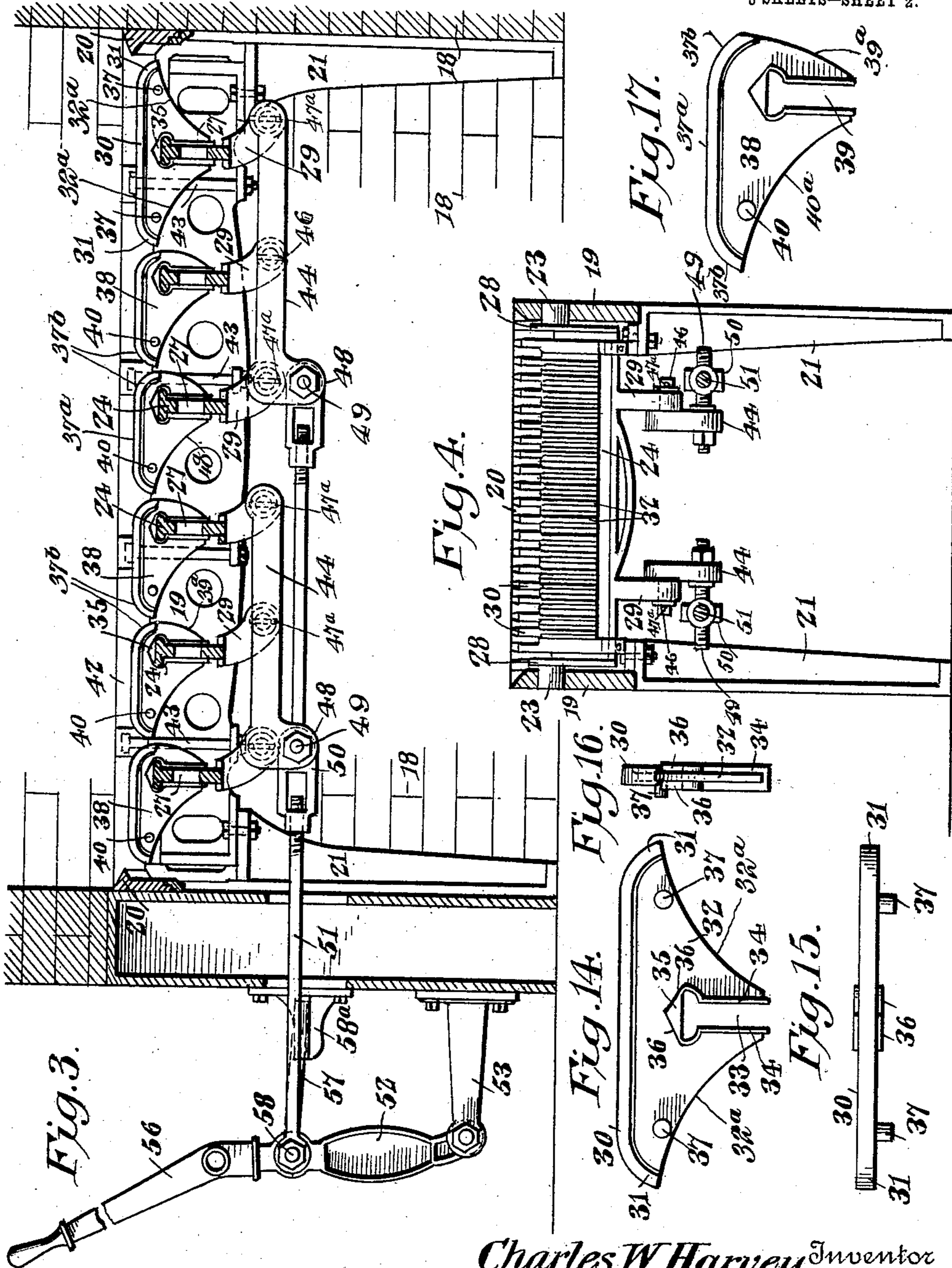
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By

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*Jas. E. McLaughlin*  
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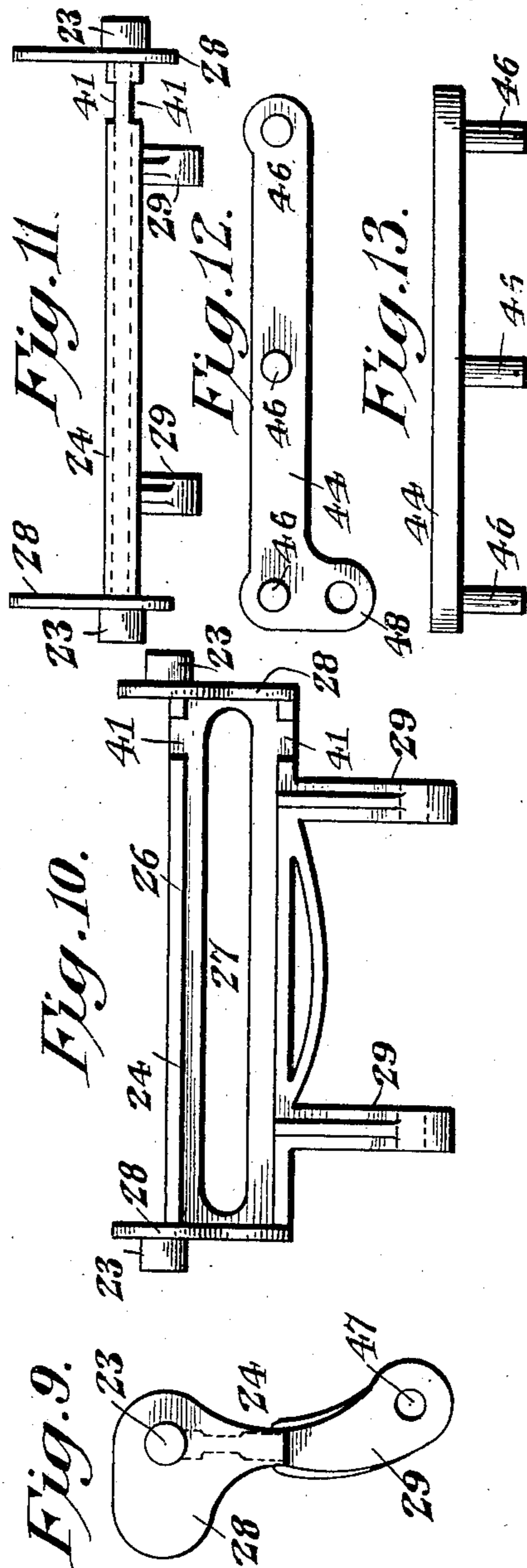
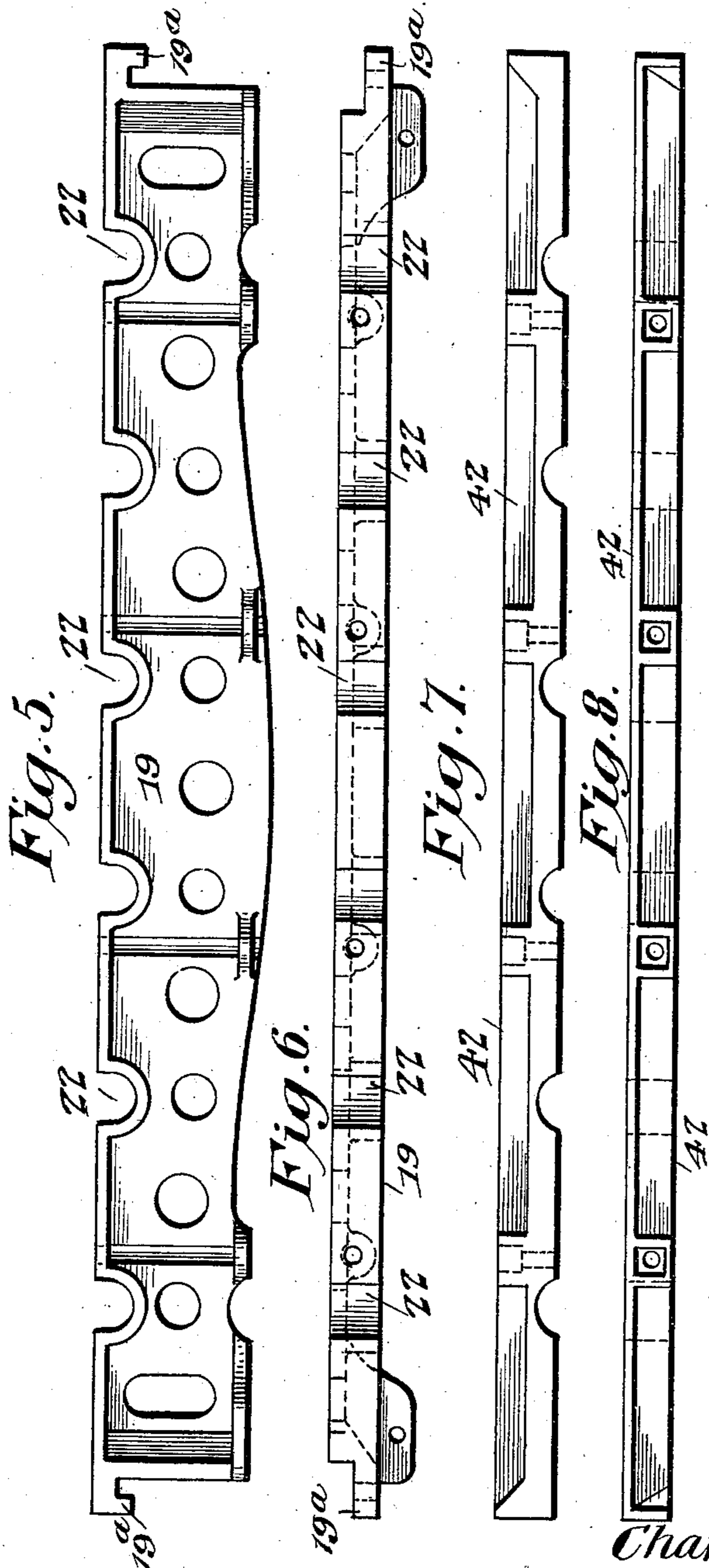
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# UNITED STATES PATENT OFFICE.

CHARLES W. HARVEY, OF NEW BRUNSWICK, NEW JERSEY.

## GRATE.

No. 918,317.

Specification of Letters Patent.

Patented April 13, 1909.

Application filed September 7, 1906. Serial No. 333,674.

*To all whom it may concern:*

Be it known that I, CHARLES W. HARVEY, a citizen of the United States, residing at New Brunswick, in the county of Middlesex and State of New Jersey, have invented a new and useful Grate, of which the following is a specification.

This invention relates to furnace grates, and one of the principal objects is to provide a structure that can be readily installed without the necessity of mounting it in the furnace walls and without weakening or altering such walls.

Another and important object is to provide a grate, wherein the bars are made of readily insertible and detachable parts, so that the grate can be easily varied to suit the different grades and character of fuel, and in case of injury the particular part affected can be removed and replaced without the necessity of an entirely new grate and without requiring the dismemberment of the entire structure.

A still further object is to provide a grate wherein the dumping and shaking operations can be easily and effectively accomplished.

The preferred form of construction is illustrated in the accompanying drawings, wherein:—

Figure 1 is a vertical sectional view of a furnace, showing the grate in elevation. Fig. 2 is a top plan view of the grate. Fig. 3 is a vertical sectional view through the same. Fig. 4 is a cross sectional view therethrough. Fig. 5 is a view in elevation of one of the side bars of the frame. Fig. 6 is a top plan view thereof. Fig. 7 is a side elevation of the cap. Fig. 8 is a plan view of the same. Fig. 9 is an end elevation of one of the body bars. Fig. 10 is a face view of the same. Fig. 11 is a top plan view of the body bar. Fig. 12 is a view in elevation of one of the links for connecting a plurality of grate bars. Fig. 13 is a plan view of the same. Fig. 14 is a side elevation of one of the grate bar leaves. Fig. 15 is a top plan view of the same. Fig. 16 is an edge view thereof. Fig. 17 is a side elevation of another form of leaf.

Similar reference numerals designate corresponding parts in all the figures of the drawings.

In the particular form of construction shown, the furnace walls are designated generally by the reference numeral 18. Within the furnace formed thereby is placed a frame

comprising side bars 19 and end bars 20 connecting the same, the side bars 19 being provided with terminal downturned hooks 19<sup>a</sup>, which interlock with the ends of the end bars 20. This frame is supported on legs 21 that are located at the corners of the frame and serve to support the same within the furnace independently of the furnace walls. The side bars 19 are provided in their upper margins with journal bearing sockets 22 that receive the gudgeons 23 of the grate bars.

The grate bars consist of body bars 24 that are substantially T-shaped in cross section, being provided with parallel sides and having along their upper edges flanges 26 that project beyond the said sides and have flat tops. The body bars are preferably cut away, as shown at 27, for the sake of lightness. The ends of these bars are provided with head plates 28, from which the gudgeons 23 project. Each bar is furthermore provided with a plurality of depending ears 29, the said ears being located contiguous to the ends of the bars. Associated with each bar are detachable leaves. In the embodiment of the invention disclosed, the leaves on the rearmost bars of the grate, one of which is illustrated in detail in Figs. 14–16, each consists of a cap 30 having downwardly curved ends 31, said cap being supported on an integral downwardly tapering centrally disposed web 32 that has oppositely concaved edges 32<sup>a</sup>. This web has a central T-shaped slot 33, opening through its lower end and terminating short of its upper end. The shape of the slot corresponds to the cross sectional shape of the body bar 24. The slot 33 is furthermore surrounded by flanges 34, the upper portions of which constitute caps 35 that are located over the slot and have downwardly inclined upper faces 36. Outstanding pins 37 are carried by the web 32 on opposite sides of the slot. The leaves carried by the remaining bars, one of which is illustrated in detail in Fig. 17, each consists of a substantially flat widened cap 37<sup>a</sup> having downwardly curved terminal portions 37<sup>b</sup> and supported by an integral downwardly tapered web 38. The slot, designated 39, is substantially the shape of the slot 33 of the first described leaf, but it is located nearer one end than the other, one pin 40 being preferably employed on one side only of the slot. It will be observed that the margin or edge of the shorter section of the leaf that is on one side of the

slot, is bulged or curved outwardly, as shown at 39<sup>a</sup>, in fact it is a continuation of the curve of the adjacent end of the cap, while that upon the other is cut away or curved inwardly, as shown at 40<sup>a</sup>, forming a sharp point at the adjacent end of the cap. It will furthermore be observed by reference to Fig. 3 that the greater portions of the leaves of one bar with their sharp ends, are in coacting relation with the lesser or rounded portions of the leaves of the next adjacent bar, and this particular relation and construction of the leaves is important, for the reasons hereinafter stated. The leaves are detachably mounted on the body bars, and for this purpose, the flanges 26 thereof have their opposite portions each cut away at one point, as illustrated at 41, the width of the cut-away portions being equal to the width of the leaves so as to permit said leaves to be slipped into place. It will thus be evident that the leaves can be readily placed upon the bar until said bar is filled, the flanges 34, caps 35 and pins 37 spacing the leaves so as to permit the proper draft of air therethrough. It will also be evident that by constructing leaves with pins of different lengths, the spaces can be readily varied and also that either single or double leaves or both may be employed in a grate as desired. The grate bars thus constructed have their gudgeons 23 located in the bearings 22 of the side bars, said gudgeons being maintained in place by cap bars 42, that are located over the side bars and extend over the gudgeons. The cap bars are held in place by bolts 43 that are passed downwardly therethrough and are suitably engaged with the side bars.

In the present construction, the grate is divided into sections, the bars of each section being simultaneously operable. To this end certain of the depending ears 29 of one series of the bars are connected by links 44 and 45, the links 44 being provided with pins 46 that pass through openings 47 in the ears, the links 45 having openings that receive the pins 46. Suitable fasteners 47<sup>a</sup> pass through the pins and serve to prevent the detachment of the parts. It will be observed that in the present embodiment, two sets of bars are thus connected, but the number may be varied according to the size of the grate. Each of the links 44 is provided with a downturned lug 48 through which passes a screw shank 49. To this shank is adjustably connected a yoke 50, having a rod 51 adjustably threaded to one end thereof. This rod is pivoted to a lever 52 fulcrumed at its lower end upon a suitable supporting bracket 53. The two levers are independently movable, and their upper ends 54 are adapted to be received in the sockets 55 of the actuating handles 56.

These levers, furthermore, carry stop and positioning pins 57 pivoted thereto by the

same bolts 58 that connect the rods 51. The pins 57 are movable to a horizontal or vertical position, and when in the former relation, have their free ends supported in projecting seats 58<sup>a</sup> carried by the front furnace wall. 70

It will be observed that in this structure, the entire grate is supported upon the legs, and no cutting or mounting of the supports in the furnace wall is necessary. Moreover as the leaves are strung upon the body bars, said bars are protected and should an accident happen to the leaves, or should they become burned out, they may be removed and replaced by new ones without entirely dismembering the grate and often without even removing the bars from the frame. The leaves form the entire upper surface of the grate and also provide the necessary air spaces, the size of which spaces can be varied as already set forth. The limit of the movement of the grate bars is determined by the pins 57. Thus when the pins are in the seats 58<sup>a</sup>, it is known that the leaves have their upper surfaces in horizontal position. On the other hand, if said pins are swung to a vertical position and the levers are operated until said pins rest upon the floor, then the faces of the leaves are in vertical position. While said leaves are readily detachable, as will be evident, still they have comparatively extended bearings on the bars, so that there is little liability of lost play. 95

The peculiar shape of the leaves and their relation is important. They have been designed after careful study and thorough experiment to serve three distinct purposes, first, to permit the ordinary shaking of the grate, second, for dumping the grate, and third, for breaking up or shaving off the crust which forms on the under side of the bed of coal. To operate the grate for ordinary shaking purposes, and assuming the bars in their normal or median positions with the upper faces of the leaves horizontal, it is only necessary for the operator to throw the lever from him or toward the fire, then back to the median or normal position. This operation is repeated as often as desired. In this movement, the coacting sections of the leaves do not separate, but rather maintain the same spaced relation and move toward each other and into contact if the lever is moved far enough. The result is that the coal is stirred up beneath without any portion being allowed to drop through. In case a crust is formed from the fire lying too long or from the use of bad coal, and it is desired to break up this crust, the lever is then drawn outwardly toward the operator or from the fire, then returned back to its original or median position. In this operation, the longer sections of the leaves are raised and moved directly away from the shorter sections of the adjacent leaves. If the lever is pulled far enough, these longer 130

sections will be moved to a perpendicular position and the sharp points will break up the crust, shaving off and dropping it into the ash pit, as the leaves return to their median or original position. One movement of this kind is generally sufficient for the purpose. For dumping the grate, the movement is repeated, a few times. On each of the latter movements, the opening between the bars is increased, and as a matter of fact when the grate is thrown wide open, said openings are about six inches wide and extend the full width of the grate.

The use of the doubled leaves on the rear bar is important, as it permits the dumping of the entire furnace or surface of the grate. If leaves similar to those employed on the other bars were used, there would be no openings behind the rear series and consequently there would be from six to eight inches of the bed at the rear that would not be dumped. The structure furthermore permits the increase of air space. Under ordinary conditions, or while the grate bars are in normal position, namely, with the leaves level on top, there is approximately fifty per cent. of air surface. By gently opening the grate, this can be increased to seventy-five per cent. Inasmuch moreover, as the grate is made up of sections, the number of which depend altogether upon the size or surface area of the furnace, the different sections may be shaken, cleaned or dumped independently of each other and an even temperature kept up. Another important feature is the employment of a plurality of depending ears on each grate bar. By this means the levers may be arranged at either or both sides of the furnace, and thus interference with exterior pipes and the like, can be more readily avoided.

From the foregoing, it is thought that the construction, operation and many advantages of the herein described invention will be apparent to those skilled in the art, without further description, and it will be understood that various changes in the size, shape, proportion, and minor details of construction, may be resorted to without departing from the spirit or sacrificing any of the advantages of the invention.

Having thus fully described my invention,

what I claim as new, and desire to secure by Letters Patent, is:—

1. In a grate, the combination with spaced rotatable bars, of leaves detachably mounted on the bars and projecting on opposite sides of the same, each of said leaves having a widened cap on its upper edge provided with downwardly curved ends, the leaves tapering from the caps toward their lower ends, the end edges of the leaves on one side of each bar being curved inwardly from the ends of the caps to produce sharp points at said ends, the opposite end edges on the other side of the bar being bulged outwardly forming substantially continuations of the curves of the adjacent ends of the caps, forming rounded ends, the sharp points of the leaves of one bar operating alongside the rounded ends of the leaves of the adjacent bar, and means for rocking the bars from a central position in opposite directions to raise either the pointed ends in order to cut into the crust of the fire above them or to elevate the rounded ends to stir the fire and prevent its dropping through the grate.

2. In a device of the class described, the combination with a grate, of an actuating lever therefor fulcrumed at its lower end, a stop and positioning pin pivotally mounted on the lever above its fulcrum, and means for supporting the pin in a substantially horizontal position, said pin being movable to a depending substantially vertical position so that its lower free end will strike the floor.

3. In mechanism of the character set forth, the combination with a furnace wall, and a grate, of an actuating lever for the grate, a stop and positioning pin pivoted on the lever for limiting the movement of said lever, and a projecting supporting seat mounted on the furnace wall and arranged to receive the free end of the pin to hold said pin in a substantially horizontal position, said pin being also movable to a depending substantially vertical position so that its lower end will strike the floor.

In testimony, that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

CHARLES W. HARVEY.

Witnesses:

EDWARD W. HICKS,

EDWARD S. RELYEA.