Jan. 6, 1931. F. DITCHFIELD 1,787,815

CUTTING DIE

Filed Sept. 8, 1927 3 Sheets-Sheet 1

Fig. 1.

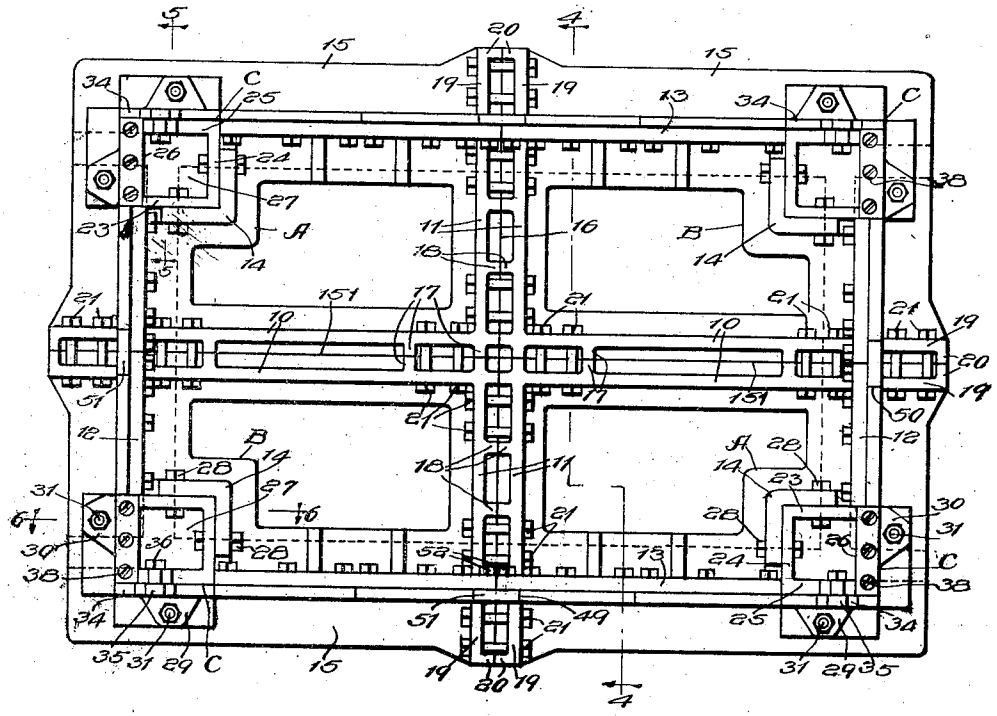


Fig. 2.

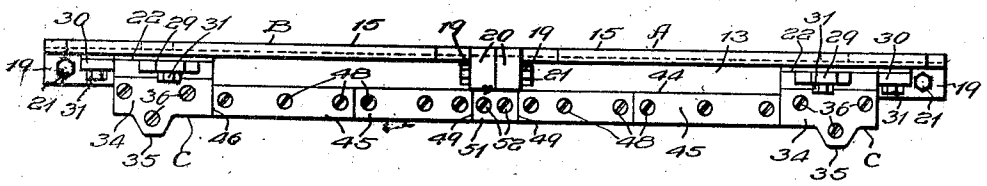
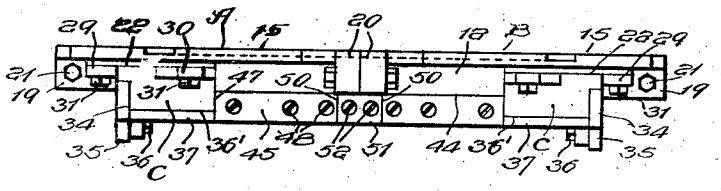


Fig. 3.



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Fig. 4.

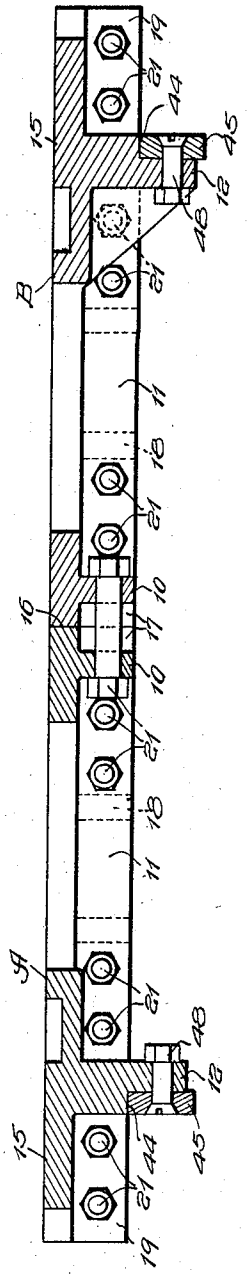


Fig. 6.

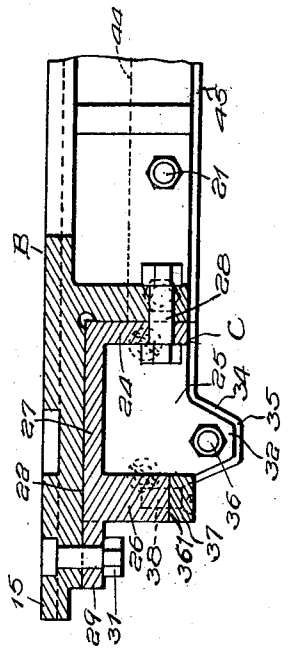
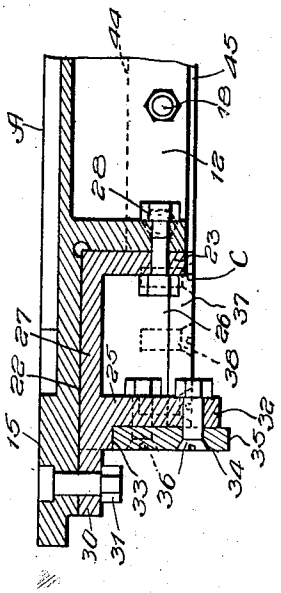


Fig. 5.



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CUTTING DIE

Filed Sept. 8, 1927 3 Sheets-Sheet 3

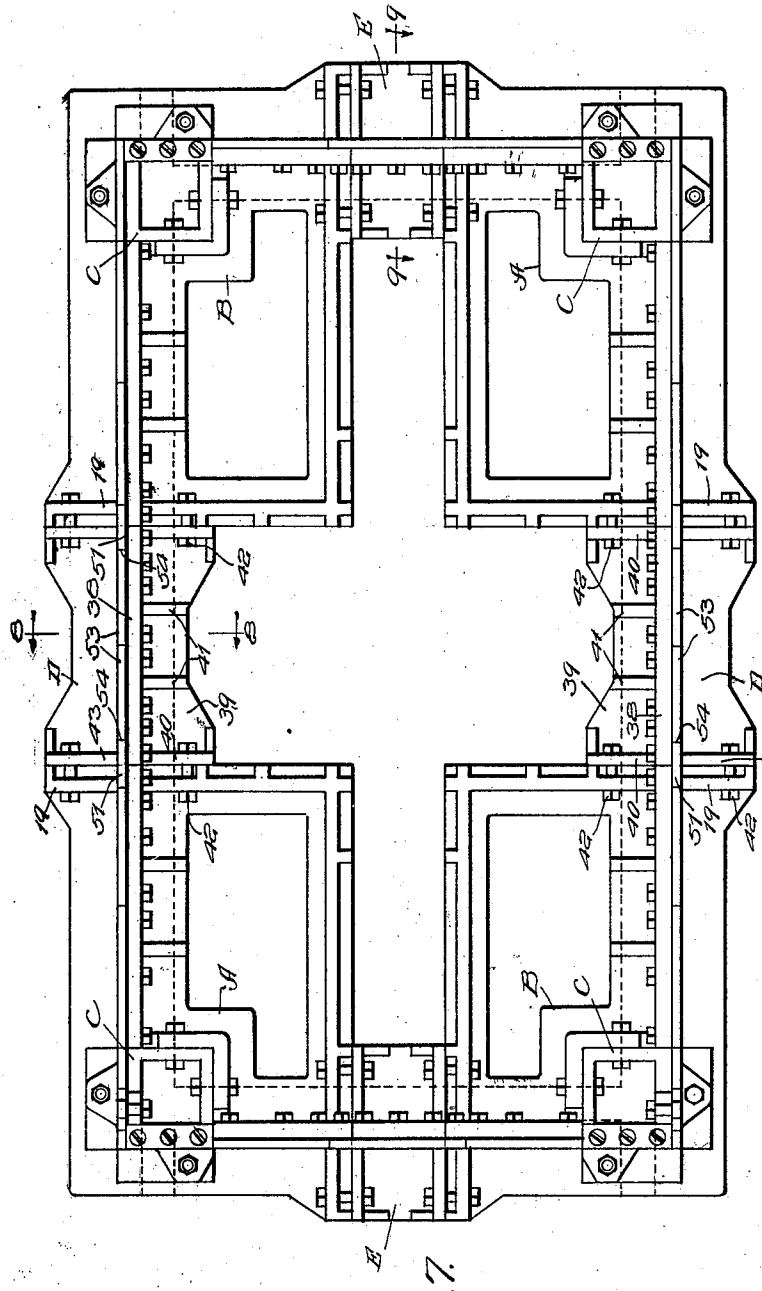


Fig. 7.

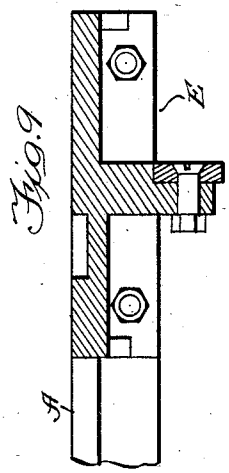


Fig. 9.

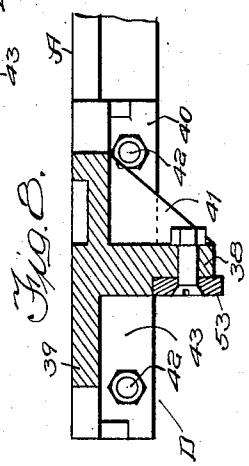


Fig. 8.

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Patented Jan. 6, 1931 1,787,815

UNITED STATES PATENT OFFICE

FRANK DITCHFIELD, OF CLEVELAND, OHIO, ASSIGNOR TO YOUNGSTOWN STEEL DOOR COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF OHIO

CUTTING DIE

Application filed September 8, 1927. Serial No. 218,218.

This invention relates to improvements in cutting dies.

The invention is designed primarily for the cutting or trimming of sections or panels of box car steel doors of the general type illustrated in Patent No. 1,342,400, granted to Allan S. Barrows June 1, 1920 to which reference should be had for a clearer understanding of the description hereinafter following. While the following description of the specific embodiment of the invention illustrated is directed to doors of the type illustrated in said Barrows patent, it will be understood by those skilled in the art that this is merely for convenience of description and is not intended by way of limitation inasmuch as the invention is adaptable to the manufacture of other articles.

In the manufacture of steel doors of the type shown in said Barrows patent, many minor variations are encounterd. For instance, the width or height of the door may vary a few inches in order to accommodate the variable size door openings of box cars. Further, different railroads employ different fixtures for hanging the doors and these different fixtures frequently necessitate variations in the upper and lower portions of the door in order to permit the attachment of the fixtures thereto. Also, as will be seen by reference to said Barrows patent, the panels themselves vary somewhat, it being observed that the middle panel has the vertical edge corrugations 23 thereof extending through the upper and lower marginal edges of the said panel whereas, in the case of the upper and lower panels A and C, the vertical edge corrugations 22 and 23 only extend to one horizontal edge of the panels.

In the economical manufacture of doors of the type indicated, it is practically impossible to have a different die for every different size door or panel and for every different variation that may occur in the location and extent of the corrugations therein. Economical quantity production necessitates that cutting dies be provided which may be readily adjustable and expanded and varied to take care of all of the possible variations entering into the manufacture of different size doors for the different railroads.

One object of my invention, therefore, is to provide an adjustable male cutting die, particularly adapted for cutting or trimming sheets or panels of different sizes both as to width and length and which are variable also as to certain corrugations or indentations therein and wherein the adjustments or interchange of parts may be readily effected with a minimum of time and labor.

More specifically, an object of my invention is to provide an adjustable male cutting die of the type indicated which is comprised of four main sections themselves adapted to trim or cut a sheet or panel of minimum size and with which are adapted to be combined extension sections for expanding the die either as to width or length or both to cut or trim sheets or panels up to the maximum size for which the die is intended.

A further specific object of the invention is to provide, in a die of the type indicated in the preceding paragraphs, interchangeable corner sections to take care of variations in corrugations or indentations that may occur in the panels or sheets to be cut.

Other objects of the invention will more clearly appear from the description and claims hereinafter following.

In the drawings forming a part of this specification, Figure 1 is a bottom plan view of a male cutting die showing my improvements embodied therein. Figure 2 is a side elevational view of the die shown in Figure 1. Figure 3 is an end elevational view of the die shown in Figure 1. Figures 4, 5 and 6 are vertical sectional views corresponding to the section lines 4—4, 5—5 and 6—6 respectively, of Figure 1, the sectional views being upon a somewhat larger scale than Figure 1. Figure 7 is a bottom plan view similar to Figure 1, but illustrating the die expanded both longitudinally and transversely to operate on larger sheets or panels. And Figures 8 and 9 are vertical sectional views corresponding to the section lines 8—8 and 9—9, respectively of Figure 7 and being upon a somewhat larger scale than the latter figure.

While Figures 1 and 7 are bottom plan views, the remaining figures are shown to illustrate the parts as the same will actually appear when in a cutting machine, the bottom plan views being shown to better illustrate the assemblies.

In carrying out my invention, in the preferred form illustrated, I employ four main frame sections A—A and B—B; four interchangeable corner frame sections C—C; interchangeable side extension frame sections D—D; and interchangeable end extension frame sections E—E.

The two main frame sections A—A are alike and also the two sections B—B are alike, it being understood that the sections B—B are complemental to the sections A—A and consequently a detailed description of one section will suffice.

Taking for illustration, the main frame section A, the same is of generally rectangular outline and preferably comprises a casting having a longitudinally extending, vertical up-standing flange 10 on its inner side; an end vertical flange 11 on its inner end; a vertically extending flange 12 on its outer end; and a vertically extending longitudinal flange 13 on its outer side. At the outside corner, the flanges 12 and 13 are so formed as to provide a re-entrant right angle corner 14. All of the said vertical flanges are formed integral with a bottom plate section 15, the plate section extending to opposite sides of the respective flanges, as clearly indicated in the drawings so that, when the sections A and B are assembled, as shown, for instance, in Figure 1, the flanges 10—10 and 11—11 will be separated from each other and there will be two lines of partitions between the main frame sections A and B, one of said lines of partition 115 extending longitudinally and medially of the frame assembly and the other line of partition 16 extending transversely and medially. As will be understood by those skilled in the art, all of the main frame sections as well as the extension sections D and E, when the parts are secured together as hereinafter described, are adapted to be directly bolted or otherwise suitably secured to the underside of a vertically reciprocating cross-head of a suitable press.

The longitudinal flanges 10 are braced on their respective outer sides by vertical ribs 17—17, the latter being so located as to abut each other when the four main sections A and B are bolted together as shown in Figure 1. Similarly, the flanges 11 are braced by vertical ribs 18 on their outer sides as clearly shown in Figure 1. Each main section A and B is further provided, outside of the flanges 12 and 13, adjacent the lines of partition, with additional vertical flanges 19—19, the latter having abutting ribs 20 as best shown in Figure 1. All of the said flanges 10, 11 and 19 are provided with alined apertures adapted to receive securing bolts 21—21 to firmly lock the parts together to form a unitary structure.

Each main section A and B, in the outer corner thereof, is provided with a flat bed 22, on which is adapted to be seated the corresponding corner section C that may be used therewith.

The corner sections C, shown in the drawing, are all illustrated as of like form and the particular form illustrated is that adapted for shearing a door panel where the edge corrugation of the latter extends to both edges thereof, as for instance, a panel section such as shown at B in said Barrows Patent No. 1,342,400. As shown, each said corner section is in the form of a generally rectangular casting having four upstanding vertical flanges 23—24—25 and 26. The corner section also has a bottom main web or plate 27 adapted to seat on the bed 22. The two flanges 23 and 24 (Figure 1) are extended at right angles to each other and fit against the vertically extending flanges of the main sections which define the re-entrant corner angle 14 hereinbefore mentioned and are adapted to be bolted thereto as by bolts 28—28. The other vertical flanges 25 and 26 are specially formed to receive the knives as hereinafter described. In addition, each corner section C is provided with two outwardly extended horizontal bottom flanges 29 and 30, perforated and adapted to receive securing bolts 31—31 for attaching to the main section A or B, as the case may be.

Referring more particularly to Figures 5 and 6, it will be seen that the flange 25 of the corner section is extended upwardly (or downwardly depending upon the manner in which the device is viewed) beyond the general plane of the remaining flanges as indicated at 32, the extension 32 being of a form to correspond roughly with the cross-section of the corrugation in the panel. Said flange 25 is rabbeted on its outer side as indicated at 33 so as to provide a seating face for the knife or cutter 34 which is of a length corresponding to the length of the side of the corner section, said knife 34 being specially shaped with an outstanding projection 35 corresponding to the corrugation in the panel where the shear is to be made. Said knife 34 is secured in place by the machine bolts 36.

The other vertical knife holding flange 26 of the corner section is made somewhat shallower than the remaining flanges and provided with a flat surface 361, which provides a seat for a horizontally disposed knife 37 secured thereto by counter-sunk machine screws 38. The active cutting edge of the knife 37 is made flush with the adjacent portion of the cutting edge of the knife 34, it being observed that the two knives 34 and 37, while extending generally at right angles to each other are disposed in two planes at

right angles to each other, one vertically and the other horizontal, thereby adapting the corner section to make a clean continuous cut at the corner of the panel while accommodating the corrugation in the panel.

In some instances, the corner sections will be of different knife edge contour than the one just described, where the same are to be used, for instance, in cutting panels or sheets that do not have corrugations extending to the edges and it will be understood that all of the corner sections with these various modifications therein are interchangeable.

Figure 1 shows the cutting die assembled for operation on minimum size sheets or panels. Figure 7 shows the die expanded for taking a larger sheet both longitudinally and laterally. To accomplish this, the extension sections D and E are employed, or some of them. Referring to the sections D, each of the latter comprises a generally elongated casting having a vertical flange 38 integral with a bottom web or plate section 39, which extends to both sides of the flange 38 as shown best in Figures 7 and 8. Said flange 38 is braced on its inner side by a plurality of vertically extending ribs 40—41, the end ribs 40 being adapted to be abutted against the adjacent portions of the main sections and bolted thereto as by the bolts 42. Similarly on the outer side, additional ribs 43 are provided adapted to be bolted to the corresponding ribs 19 of the main sections. By having extension sections D of different lengths, it is evident that the die can be extended lengthwise to any desired extent.

The end extension frames E are similar in all respects to the extension sections D and are secured to the main sections in like manner so that a detailed description thereof is deemed unnecessary.

Referring now to the cutting knives which are secured to the main sections and the extension sections, it will be noted that each of the flanges 12 and 13 of the main sections is rabbeted (see Figure 4, as indicated at 44) to form a knife receiving seat. Knives 45 are secured to these seats and it will be observed (see Figures 2 and 3) that these knives are extended at the corners to a point adapted to abut the corresponding knives of the corner sections C, as indicated at 46 and with the active edges of the knives 45 flush with the corner section knives. Said knives 45 are secured by bolts 48. However, the knives 45 are not extended to the partition lines of the main sections A and B but are terminated a short distance therefrom as indicated at 49 and 50 in Figures 1, 2 and 3. When the cutting die is used without any extension frames D or E, the gaps thus left between the cutting knives 45 are bridged by the gap bridging knives 51—51, each being secured in position by two bolts 52, one to one main section and the other to the corresponding adjacent main section. In this manner, it will be observed that the cutting knives 45 do not have to be disturbed or changed when any expansion of the dies is made. In furtherance of this improvement, each expansion section D or E will be provided with a main knife 53 secured thereto and the ends of which will terminate short of the ends of the extension section as indicated at 54 so that similar or the same gap bridging knives 51 may be employed and secured in like manner to the main sections and extension sections to complete the knife cutting edge. In other words, when the die is expanded and an extension section inserted, it is only necessary to secure a short section of knife to complete the cutting edge, thus reducing the amount of labor and time required in effecting a change.

I have not deemed it necessary to illustrate any female die since this may be of any well known construction so long as it is of expansible type to adapt it for co-operation with the improved male die in any of its adjusted conditions.

From the preceding description, it will be seen that my improvements permit the cutting of sheets or panels having a wide range of variations as to length or width and contours at the corners, all changes being effected with a minimum amount of labor and time and only a minimum number of interchangeable parts are required to accommodate the entire range of adjustments, thus resulting in economical production of panels or sheets.

Although I have herein shown and described what I now consider the preferred manner of carrying out my invention, the same is merely illustrative and I contemplate all changes and modifications that come within the scope of the claims appended hereto.

I claim:—

1. A corner frame section having two upstanding flanges on the inner portion thereof arranged at right angles and adapted to fit against and be secured to correspondingly arranged flanges of a main die frame, the said corner frame section having, on its outer portion, when in operative position, two knife-holding seats.

2. An expansible, substantially rectangular cutting die including: four main frame sections having their lines of partitions extending lengthwise and crosswise and adapted to receive extension frame sections between them either lengthwise, cross-wise, or both; each said main sections having knives secured thereto along its outer sides, said knives terminating short distances away from the respective partition sides of the sections; and detachable knives extending from said terminii of said first named knives onto the next adjacent section.

3. A main frame section for a detachable cutting die, said section having two outside cutting edges extended at right angles to

each other and provided at the outer corner thereof with a re-entrant angle and a bed whereby a removable corner section is adapted to be secured on said bed and within said re-entrant angle.

4. An extension frame section for an expansible male cutting die, said section comprising a casting having a bottom plate and a vertically extending flange integral therewith, said flange having a knife seat thereon, said flange, at its ends, being re-enforced by integrally formed ribs, the latter being perforated and adapted to be secured to adjacent die sections.

5. A sectional die comprising a plurality of sections secured together; plurality of knife sections detachably secured to said frame sections, one of the knife sections bridging the gap between two frame sections and rigidly secured to each of the frame sections.

6. A variable size die comprising: four main sections; four detachable corner sections, each secured to the outer corner of a main section; and detachable extension sections, one on each side of the die and interposed between two adjacent main sections, whereby the corner sections are interchangeable for others having different characteristics and either or both opposite pairs of extension sections may be interchanged for others of different length or omitted to thereby adapt the die for cutting rectangular blanks of different widths and/or lengths.

7. A variable size die comprising: four main sections; four detachable corner sections, each secured to the outer corner of a main section; detachable extension sections, one on each side of the die and interposed between two adjacent main sections; cutting knives secured to each of the main and extension sections, said knives terminating short of those ends of the respective sections adjacent the next extension or main section; and removable knives bridging gaps between said first named knives and each detachably secured to two adjacent sections.

8. A male cutting die for rectangular panel sheets and the like, comprising: a main rectangular frame having cutting knives secured thereto along each pair of opposite edges, said frame having re-entrant angle sections at each of the corners thereof and provided with a bed at each corner extending within the re-entrant angle section thereof; and detachable corner frame sections, each mounted on a corner bed and partly extended within the re-entrant angle section of the main frame and secured to the latter, the outer portion of each corner frame section having cutting knives secured thereto positioned to form continuations of the edge knives of two adjacent sides of the main frame.

9. A cutting die frame having two knife-holding seats meeting to provide a corner substantially at right angles to each other, the plane of one of said seats being disposed horizontally and the plane of the other seat being disposed vertically.

10. A corner frame section adapted for attachment to a main cutting die; said section having flanges by which it is adapted to be secured to a main frame, said section having two knife-holding seats extending generally at right angles to each other and meeting to provide a corner, one of said seats being disposed in a horizontal plane and the other in a vertical plane.

11. An expansible substantially rectangular cutting die including: four main frame sections having their lines of partitions extending lengthwise and crosswise, each of said sections having knives secured to the two sides thereof opposite the respective partition sides, the partition sides of said sections being provided with correspondingly located apertures for the reception of removable attaching elements, the partition sides of said sections being so formed that the same are adapted to be abutted against each other and/or to abut correspondingly formed and apertured extension frame sections therebetween whereby the cutting die is adapted for expansion either lengthwise, crosswise, or both, for the cutting of blanks of various sizes.

In witness that I claim the foregoing I have hereunto subscribed my name this 3rd day of September, 1927.

FRANK DITCHFIELD.