

No. 689,675.

Patented Dec. 24, 1901.

A. JOHNSON.
SALT GRAINER.

(Application filed Jan. 14, 1901.)

(No Model.)

2 Sheets—Sheet 1.

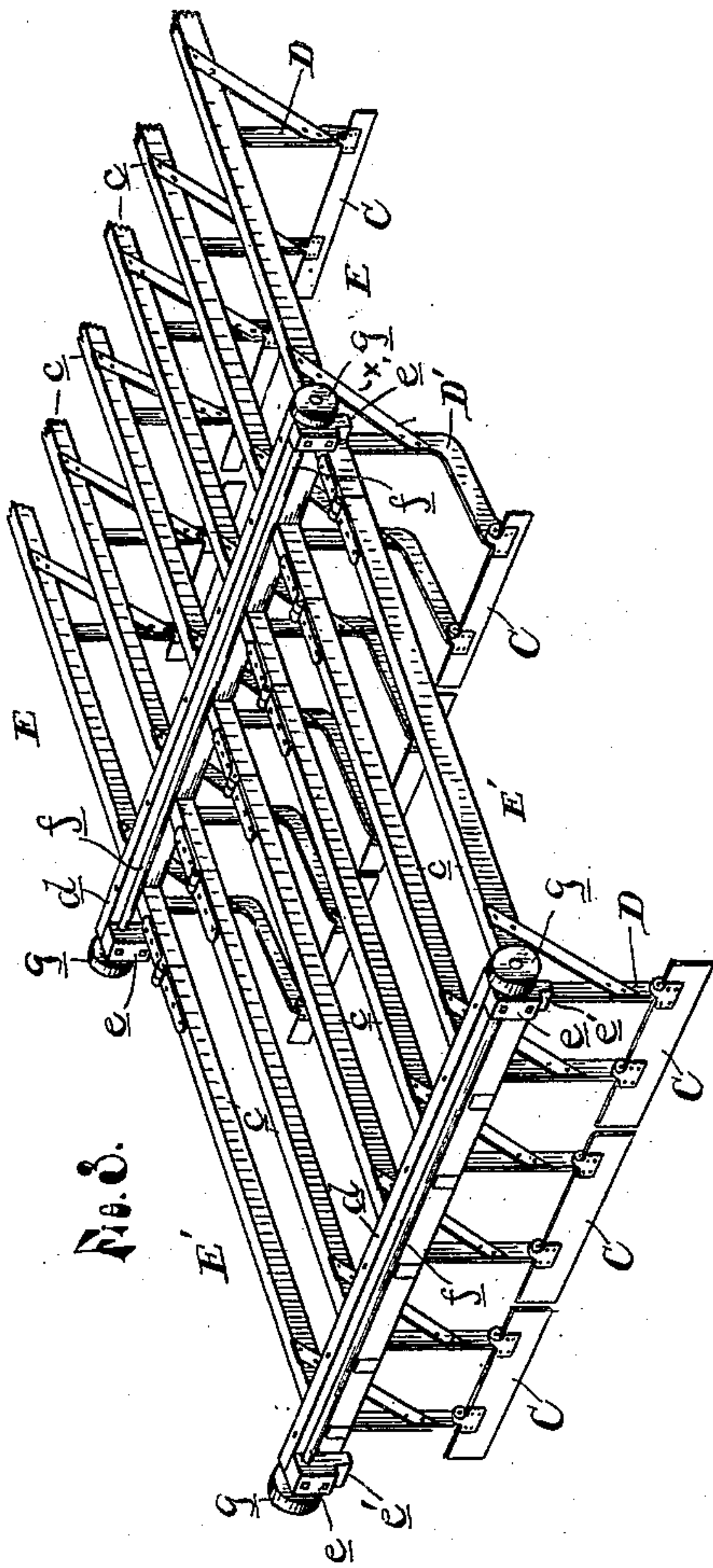


Fig. 1.

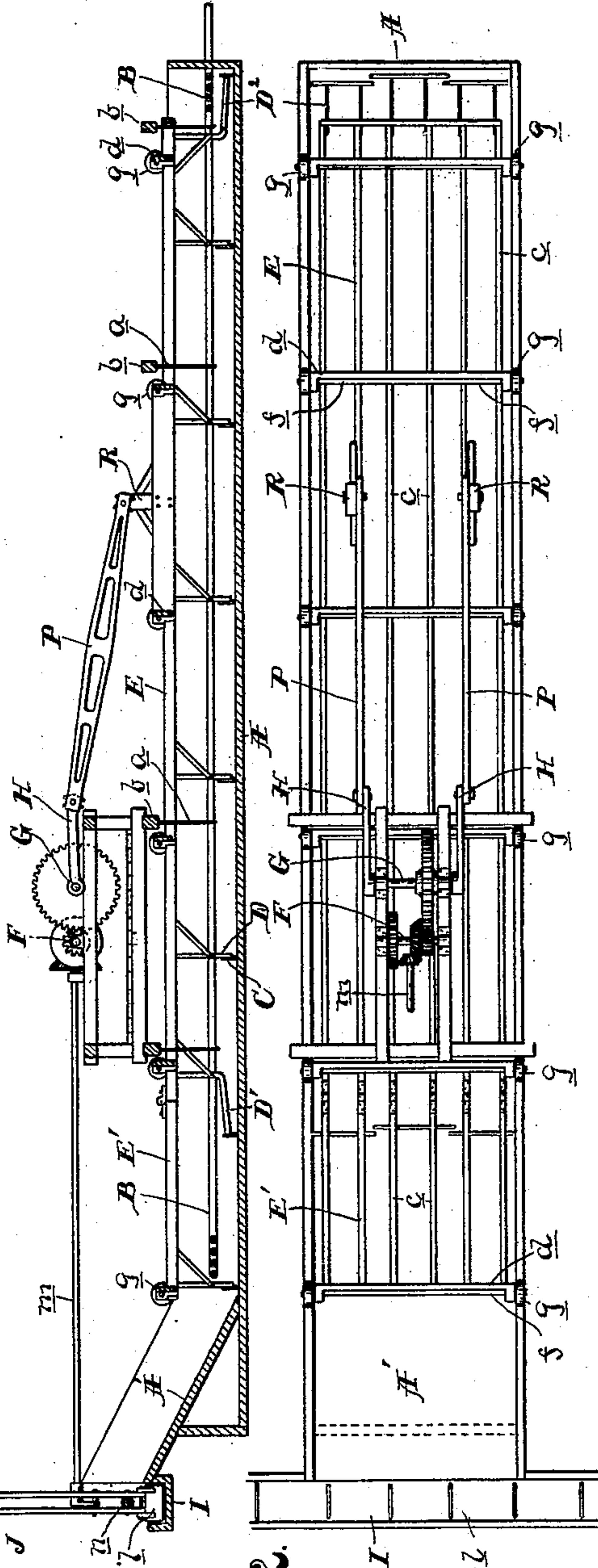


Fig. 2.

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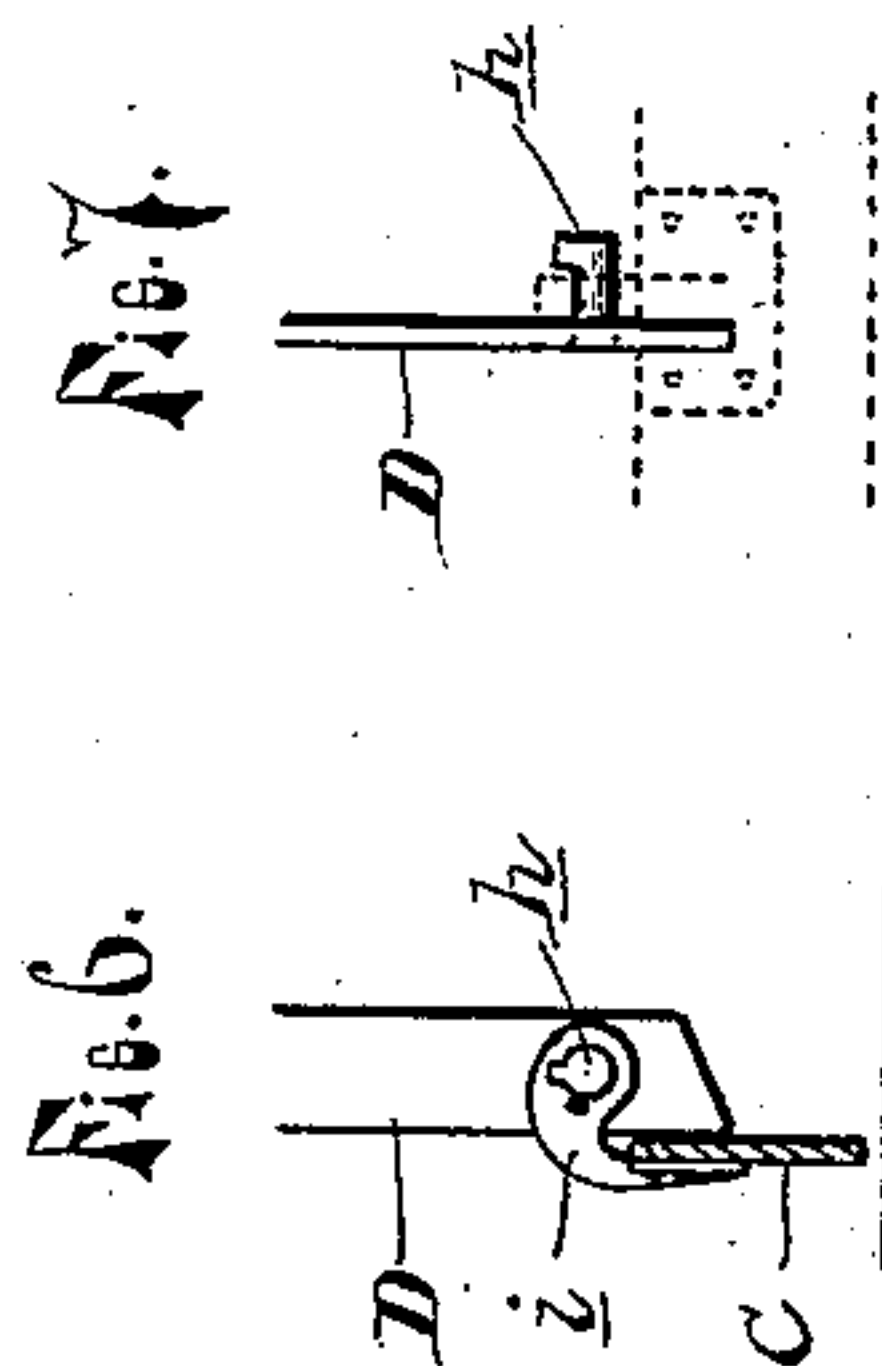
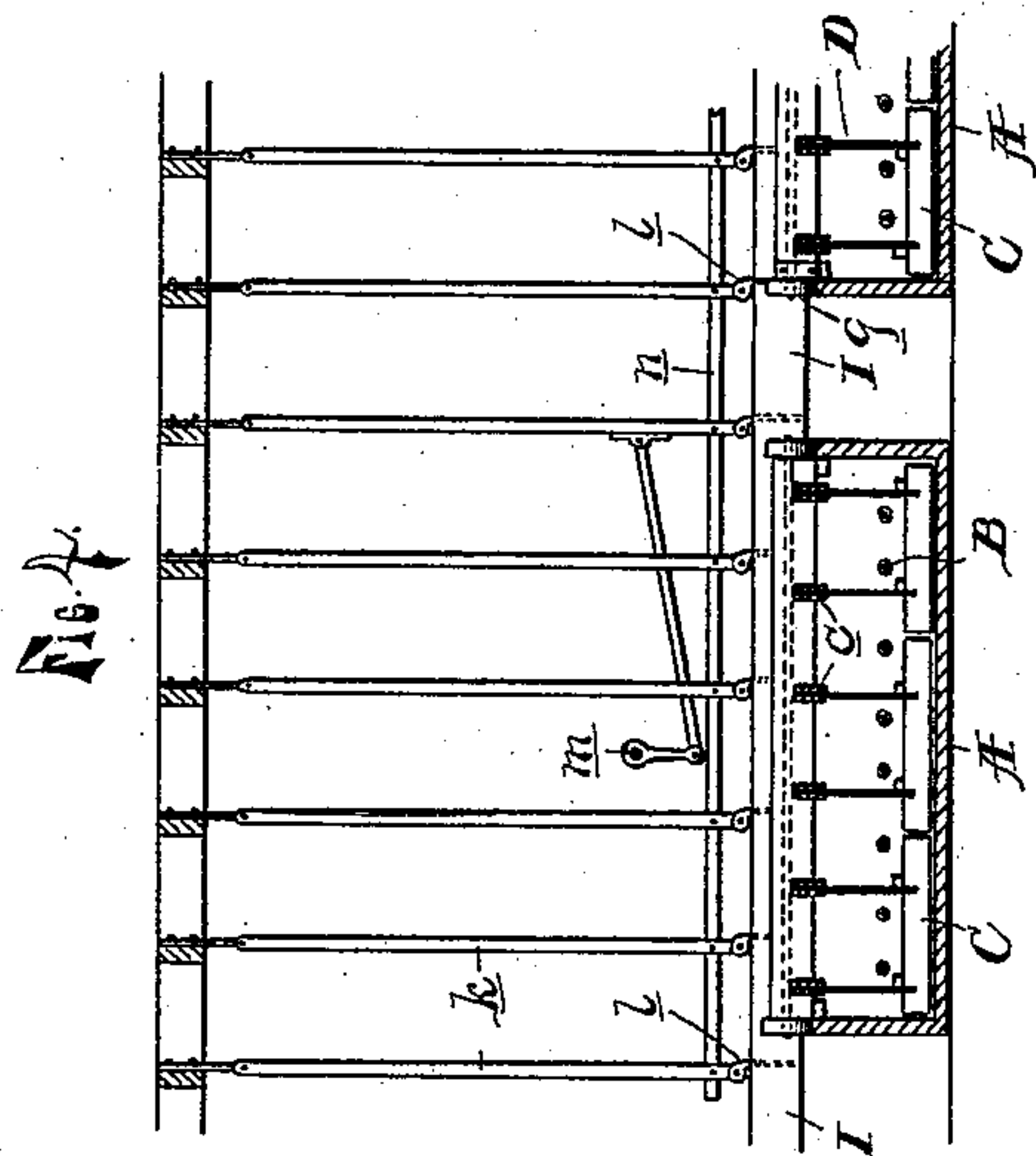


Fig. 6.

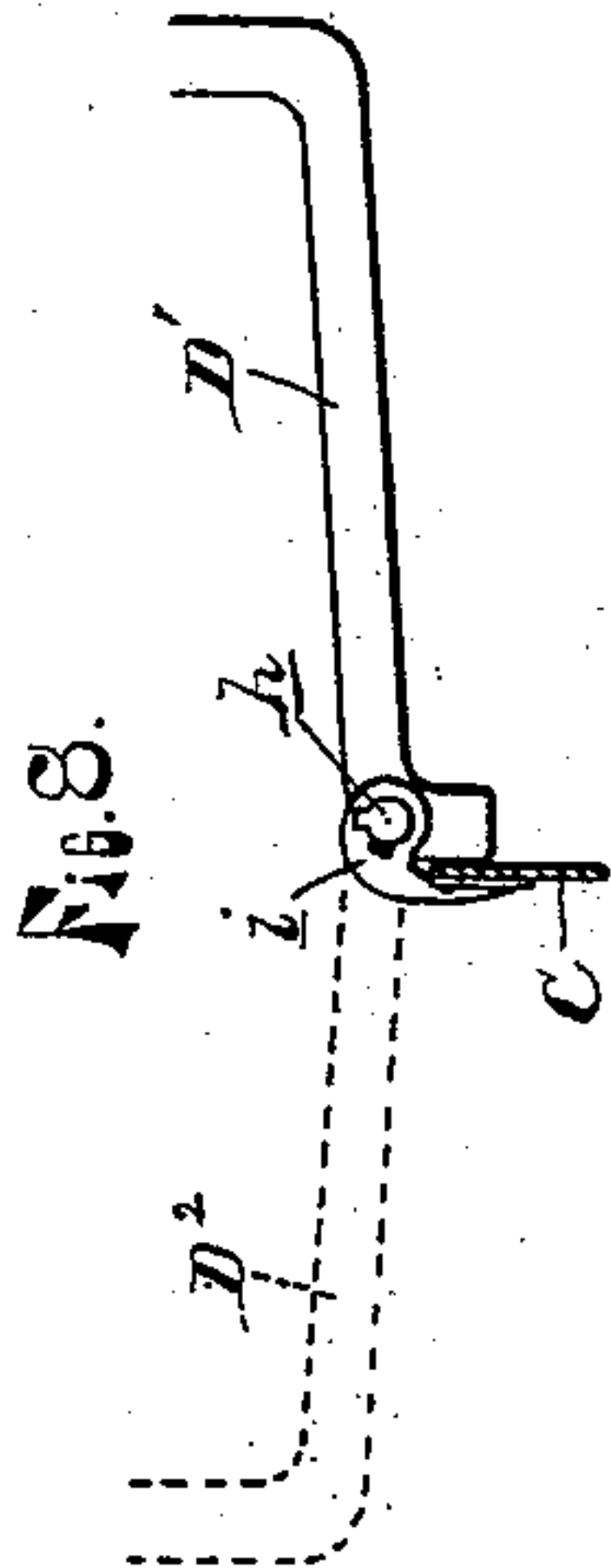


Fig. 8.

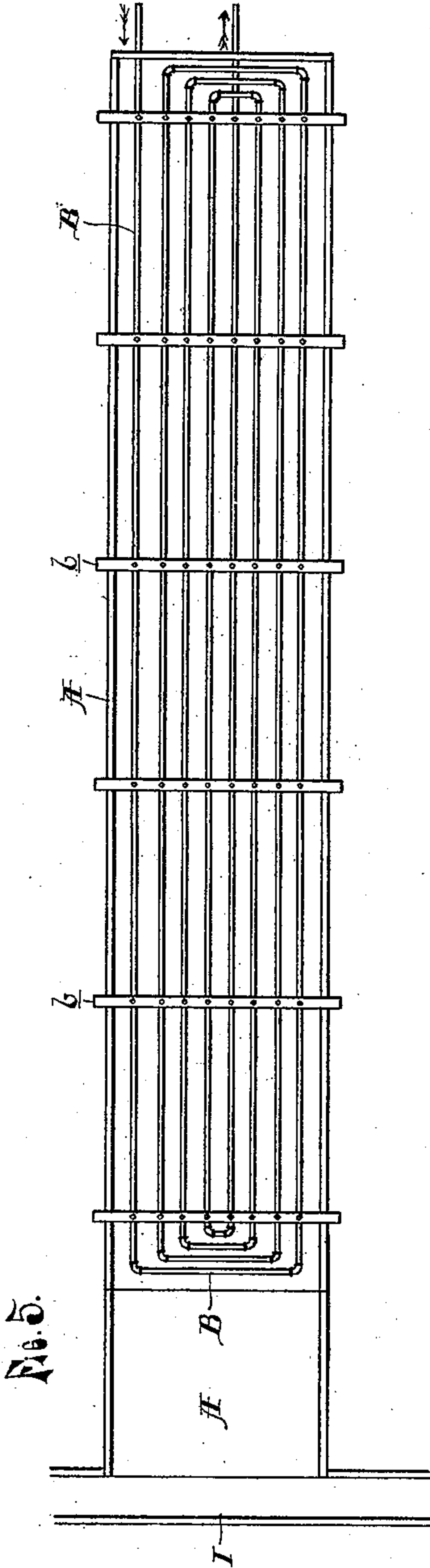


Fig. 5.

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UNITED STATES PATENT OFFICE.

ANDREW JOHNSON, OF SAGINAW, MICHIGAN.

SALT-GRAINER.

SPECIFICATION forming part of Letters Patent No. 689,675, dated December 24, 1901.

Application filed January 14, 1901. Serial No. 43,099. (No model.)

To all whom it may concern:

Be it known that I, ANDREW JOHNSON, a citizen of the United States of America, residing at Saginaw, W. S., in the county of Saginaw and State of Michigan, have invented certain new and useful Improvements in Salt-Grainers, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention has particular reference to improvements in apparatus for carrying out the so-called "grainer" process of making salt, which consists in evaporating salt brine in large open vats or so-called "grainers" by means of steam heat applied through pipes submerged in the brine and in which mechanical devices are applied to remove the salt as fast as it is made from the bottom of the vats. It is a well-known fact that salt made by this process is of different quality from that made by other processes and is much preferred thereto for certain industrial applications, and it is also well known that the particular construction of the apparatus bears a direct relation to the quantity and quality of the product; and it is the object of my invention to provide improved apparatus for carrying out this process on a larger and more economical scale and to obtain a more perfect product than heretofore.

To this end my invention consists in the improved construction, arrangement, and combination of certain parts, forming in part an improvement upon prior Letters Patent, No. 267,085, granted to me November 7, 1882, all as more fully hereinafter described, and shown in the accompanying drawings, in which—

Figure 1 is a vertical longitudinal section of a grainer provided with my improvements. Fig. 2 is a plan thereof. Fig. 3 is a perspective view of a portion of the scraper device detached. Fig. 4 is a vertical cross-section showing the collecting device. Fig. 5 is a diagram plan of the salt-grainer without the scraper and showing the arrangement of the heating-pipes. Figs. 6, 7, and 8 are details relating to the construction of the scrapers.

A represents one of the grainers of a salt plant. It is of known construction and provided at the head with the usual incline A'. It is to be understood that a number of like

grainers are placed side by side with suitable passage-ways between them. In these grainers the salt brine is evaporated by means of steam circulated through pipes submerged in the brine.

The preferable way in which I heat the brine is by means of a steam-coil B, formed of one continuous pipe coiled in parallelism with the sides and ends of the grainer to form a connected series of rectangular courses one within the other and with the ends of the coil extending out through the end of the grainer, as shown, for connecting it with the source of steam. In this way the steam which is admitted into the outer course circulates positively through every part of the coil and distributes the heat equally throughout the whole grainer, which is a requisite condition for obtaining a uniform product. This heating-coil is freely suspended some distance above the bottom of the grainer by means of suitable hangers *a* and cross-bars *b*, so that the space underneath the coil is entirely unobstructed for the operation of the scrapers. These scrapers consist of blades *C*, pivotally secured to arms *D*, projecting downwardly into the brine from a reciprocating carrying-frame *E*, supported upon the side walls of the grainer. This frame *E* is a rigid rectangular frame composed of longitudinal bars *c* and intersecting transverse supporting-bars *d*. To the outer ends of the transverse bars are secured wooden boxes *e*, in which are journaled the transverse shafts *f*, to which small wheels *g* are rigidly secured, all so arranged as to support the carrier-frame upon the side walls of the grainer free to travel thereon, suitable track-rails, preferably of hard wood, being provided for the wheels to travel thereon.

To prevent the carrier-frame from leaving the track, the boxes *e* are made with downwardly-extending projections *e'*, which are adapted to prevent the frame from leaving the track.

The frame *E* extends the whole length of the grainer, and to enable it to travel on the inclined end portions A' the portion E' of the carrier-frame is hinge-connected to the remaining portion.

The arms *D* are secured to the longitudinal bars of the carrier-frame and are

strengthened by braces. They extend down into the brine between the interstices in the heating-pipes, and the scraper-blades are pivotally suspended therefrom without quite touching the bottom of the grainer. To this end each arm is formed of bar-iron, with a short pin *h* on one side adapted to engage a hinge-eye *i*, secured to the scraper-blade. The end of the pivot-pin has an upturned lug or feather, and the hinge-eye has a corresponding feather-way, all arranged as shown in detail in Figs. 6 and 7. By this construction the blades may be easily removed or attached without disturbing the arms, while at the same time they cannot move laterally or become accidentally unhinged.

The scrapers are spaced longitudinally at intervals apart, the distance between them being less than the length of travel of the carrying-frame, and preferably instead of having one scraper reaching across the whole width it is made up of several sections, each carried by two arms, the sections where admissible being also placed slightly out of line with each other, as shown in one instance in Fig 3.

The two scrapers which operate in the spaces beneath the ends of the heating-coil are secured to the arms $D'D^2$, which at their lower ends are formed with horizontal extensions of a length to extend beneath the ends of the coil. As shown in Fig. 8, the scraper-blade is secured to both arms $D'D^2$ in the same manner correspondingly to the other scrapers, whereas the horizontal extensions of the arms are in opposite directions, as shown by the full and dotted lines.

The carrying-frame is reciprocatingly operated by means of two pitmen *P* of considerable length and operating in vertical planes above the carrying-frame. To this end a drive-shaft *F*, to which the power is conveyed, is mounted upon a suitable supporting-frame above the grainer. From this drive-shaft a slow continuous motion is conveyed through intermediate gearing to the crank-shaft *G*, which has cranks *H* at opposite ends, to which the pitmen are connected. As shown, the pitmen are respectively connected to two posts *R* upon opposite sides of the longitudinal center of the carrying-frame, and any tendency to lateral vibration or jarring motion is thereby avoided. It will be seen that as the carrying-frame reciprocates back and forth, the scraper-blades being held rigid in position in the forward motion by portions of the arms extending beneath the pivots they will scrape the accumulated salt on the bottom of the grainers toward the head by successive steps and deposit it upon the outer end of the inclined head *A'*. In moving backward the scraper-blades swing on the pivots. In front of the incline *A'* is a trough *I*, which extends in front of all the grainers, and as the quantity of salt deposited by the scrapers upon the top of the incline increases it will be pushed farther out and fall into the trough after having had time to drain.

The salt deposited in the trough is collected for further treatment by a series of swinging scrapers *J*, which carry the salt along the trough to a place of deposit. Each scraper *J* consists of a pair of hangers *k*, pivotally suspended from overhead and carrying at its lower end a scraper-blade *l*, pivotally secured to the lower end of the hangers in the same manner as described for the scrapers *C*. The scraper-blades *l* swing perfectly free of the sides and bottom of the trough, and a constant swinging motion is imparted to them in any suitable manner to cause the salt in the trough to be scraped along toward one end. As shown in the drawings, this motion is transmitted from the drive-shaft through a shaft *m*, having a crank-and-pitman connection with one pair of hangers, the hangers being connected together to swing in unison by the connecting-bar *n*. The swinging scrapers *J*, as will be seen, can be reversed, so that, if desired, the salt may be conveyed to the other end of the trough.

My improved apparatus is adapted to carry out the so-called "grainer" process of making salt on a much larger and more economical scale than heretofore. Thus the size of the grainers admissible with my construction may be from one hundred and fifty to two hundred feet long and ten to fifteen feet wide. In devising my scraper it must be understood that its construction involves the consideration of many different factors aside from the mere mechanical problem involved, for the reason that its operation has a decided bearing on the quantity and quality of the output, as in addition to acting as a mere scraper it has the function of an agitator, and the manner in which the brine is agitated is of the greatest importance in getting the quantity and quality desired. The complete elimination of certain impurities from the brine must also not be interfered with by the operation of the scrapers, as these impurities must be allowed to incrustate on the heating-pipes and be separately removed from time to time. Consequently provision has to be made for this operation. All jarring, vibrating, or scraping motion of the parts of the scraper in contact with other parts, as well as all wear of parts tending to destroy a perfect adjustment, must therefore be avoided. Likewise there should be no parts needing lubrication where the danger exists of contaminating the brine therewith. These and other considerations known to the practical salt-maker as a result of long experience with this class of apparatus have guided me in the construction of my improved salt-grainer, and the apparatus will be found to make the highest grade of salt in a most economical manner.

What I claim as my invention is—

1. The combination with a grainer of rectangular shape, of a heating-coil suspended therein above the bottom thereof and consisting of a continuous pipe coiled within the

grainer in parallelism with the sides and ends into a connected series of like rectangular courses, one within the other, the transverse portions of said courses adjacent to the ends of the grainer and the longitudinal portions extending between said transverse portions and forming open spaces between them, and a reciprocating scraper of corresponding length with the heating-coil and comprising a frame supported free to travel upon the side walls of the grainer and provided with depending arms extending downwardly through the open spaces in the heating-coils below the same and carrying scraper-blades pivotally suspended from the arms in the space below the coil, the arms adjacent to the ends of the coil formed with extensions adapted to project beneath the transverse portions of the coil and having the scraper-blades pivotally secured to the ends of said extensions, substantially as described.

2. The combination with the grainer and the heating-coil suspended above the bottom thereof, of a reciprocating scraper device comprising a frame supported upon the sides of the grainer free to travel and arms rigidly secured thereto and projecting downwardly through the interstices in the heating-coil below the same, braces connecting said arms at a point above the coil with the frame in line with the travel and scraper-blades pivotally suspended from the arms in the space below the coil, said arms extending below their pivotal connection with said blades to form stops to prevent the movement of said plates in the forward movement of the scraper-frame.

3. The combination with the grainer A having the inclined head A', of the heating-coil B within the grainer formed with a connected series of rectangular courses, one within the other, and suspended above the bottom of the grainer, substantially as described to form an open and unobstructed space beneath the heating-pipes from end to end of the grainer, a reciprocating carrying-frame supported upon the sides of the grainer and having a section E' at the head of the grainer hinged thereto, arms secured to the carrying-frame and extending downwardly into the brine between the open interstices in the heating-coil and scrapers pivotally secured to the ends of said arms and extending transversely in the space below the heating-pipes, the arms D' D² carrying the scrapers adjacent to the ends of the heating-coil, having bends extending outwardly toward the ends of the grainer below the heating-coil.

4. The combination with the grainer A having the inclined head A', of the heating-coil B formed with a connected series of rectangular courses, one within the other and suspended above the bottom of the grainer, to form an unobstructed space in the bottom of the grainer, beneath the coil extending from

end to end of the grainer substantially as described, the reciprocating carrying-frames supported upon the side walls of the grainers and composed of the sections E E' hinged together, of the arms D D' D² secured to the carrying-frame and extending downwardly below the heating-coil in the interstices therein, the arms D' D² having horizontally-extending lower ends and the scrapers C hinged to said arms and extending transversely in sections in the space below the heating-coil, said arms extending below the pivotal connection with the scrapers and having hinge-pins *h* formed with the lugs *h'*.

5. The combination with the grainer and the heating-coil suspended above the bottom thereof, of a reciprocating scraper device composed of a frame supported upon the sides of the grainer free to travel, arms secured to said frame and projecting downwardly through the heating-coil into the space below, and scraper-blades pivotally secured to said arms and extending transversely the grainer and wholly within the space below the coil, the arms carrying the scraper-blades adjacent to the ends of the coil provided with bends extending in the direction of the travel of the scraper below the coil, respectively, in opposite directions at the two ends whereby said arms are adapted to project the scraper-blades carried at the ends of said bends alternately beneath the end portions of the coil in the travel of the frame.

6. In an apparatus for making salt, the combination of the grainer A having the incline A' at the head of the grainer, the heating-coil B suspended in said grainer, the reciprocating carrying-frame E having the hinged section E', arms D D' D² secured to said carrying-frame and extending through the interstices in the heating-coil in the space beneath the same, the scraper C hinged to the lower ends of said arms and extending transversely of the grainer in the space beneath the heating-coil, the trough I at the end of the incline A' transversely thereof, said end extending beyond the travel of the carrying-frame and its scrapers, a series of scrapers pivotally secured to pendulously-suspended hangers free to swing in said trough, and mechanism for actuating said scrapers, comprising the drive-shaft F and crank-shaft *g* transversely mounted above the grainer and having actuating connection with the carrying-frame and the shaft *m* extending longitudinally above the grainer conveying motion from the drive-shaft to the hangers.

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

ANDREW JOHNSON.

Witnesses:

OTTO F. BARTHEL,
JOSEPH A. NOELKE.