June 17, 1952 G. KOMAREK 2,600,408

FLUXING APPARATUS

Filed Jan. 15, 1951 3 Sheets-Sheet 1

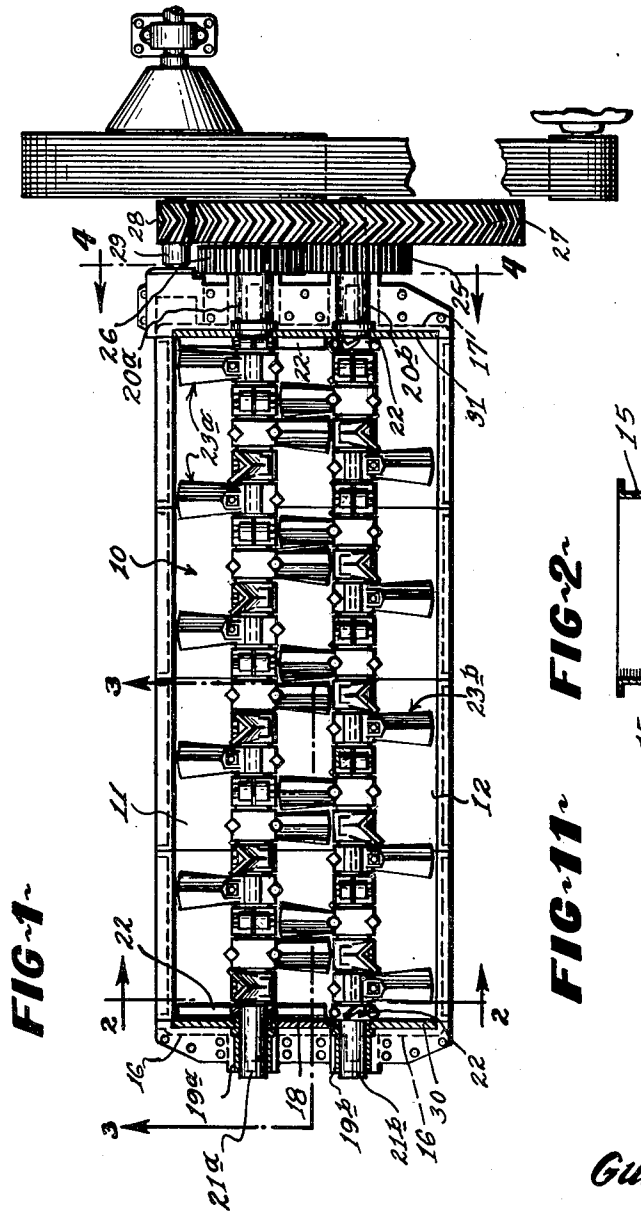


FIG-1

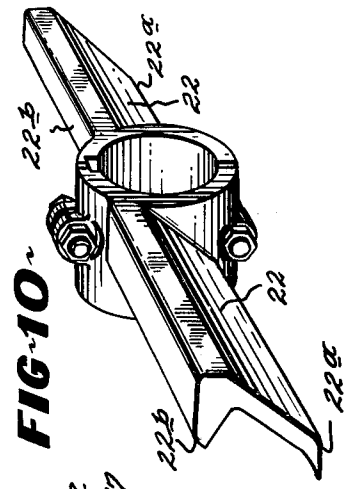


FIG-10

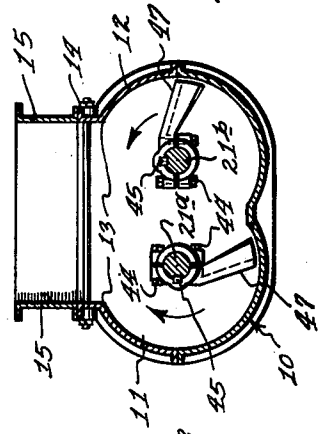


FIG-2

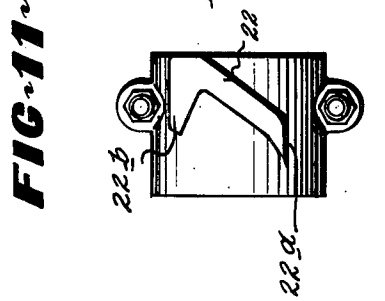


FIG-11

INVENTOR

Gustav Komarek

BY Cushman, Darby & Cushman

ATTORNEYS

June 17, 1952 G. KOMAREK 2,600,408

FLUXING APPARATUS

Filed Jan. 15, 1951 3 Sheets-Sheet 2

FIG-3

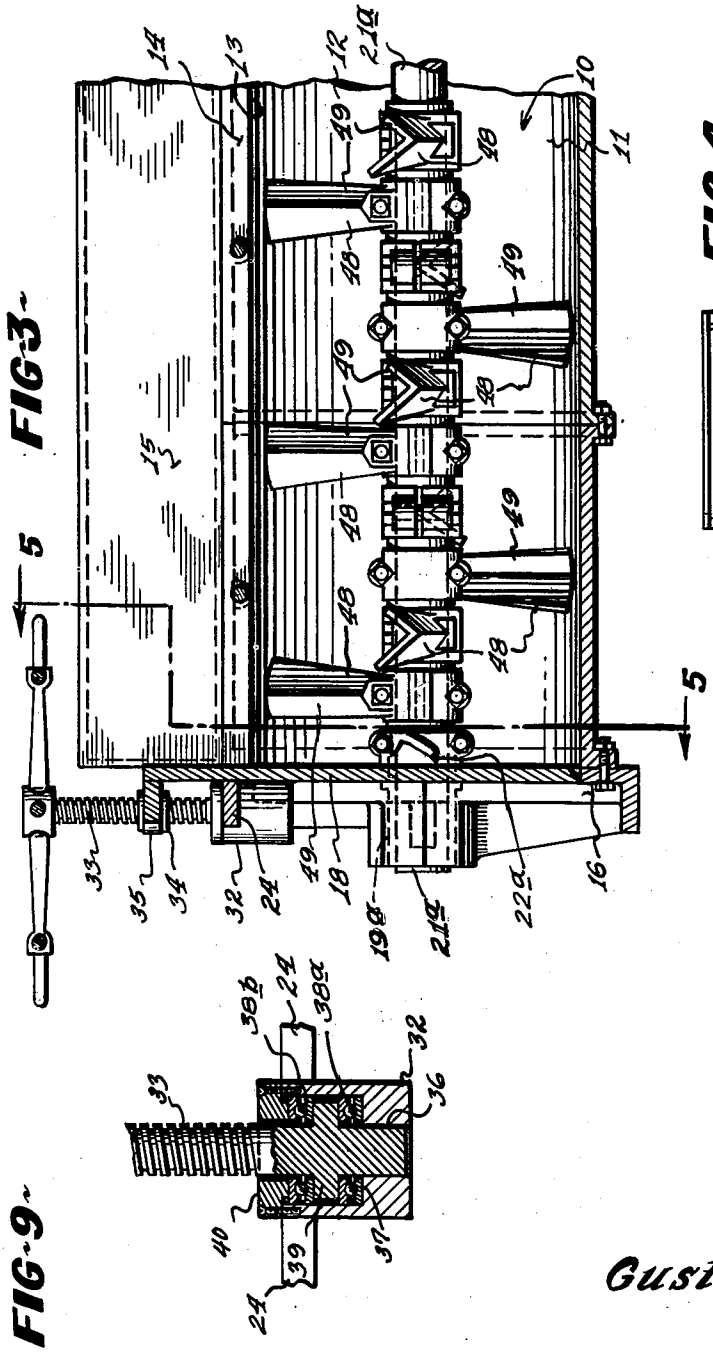


FIG-4

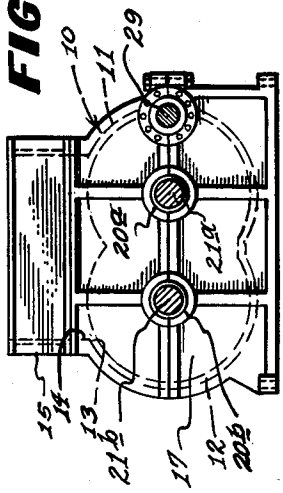


FIG-9

INVENTOR

Gustav Komarek

BY Cushman, Darby & Cushman

ATTORNEYS

June 17, 1952 G. KOMAREK 2,600,408

FLUXING APPARATUS

Filed Jan. 15, 1951 3 Sheets-Sheet 3

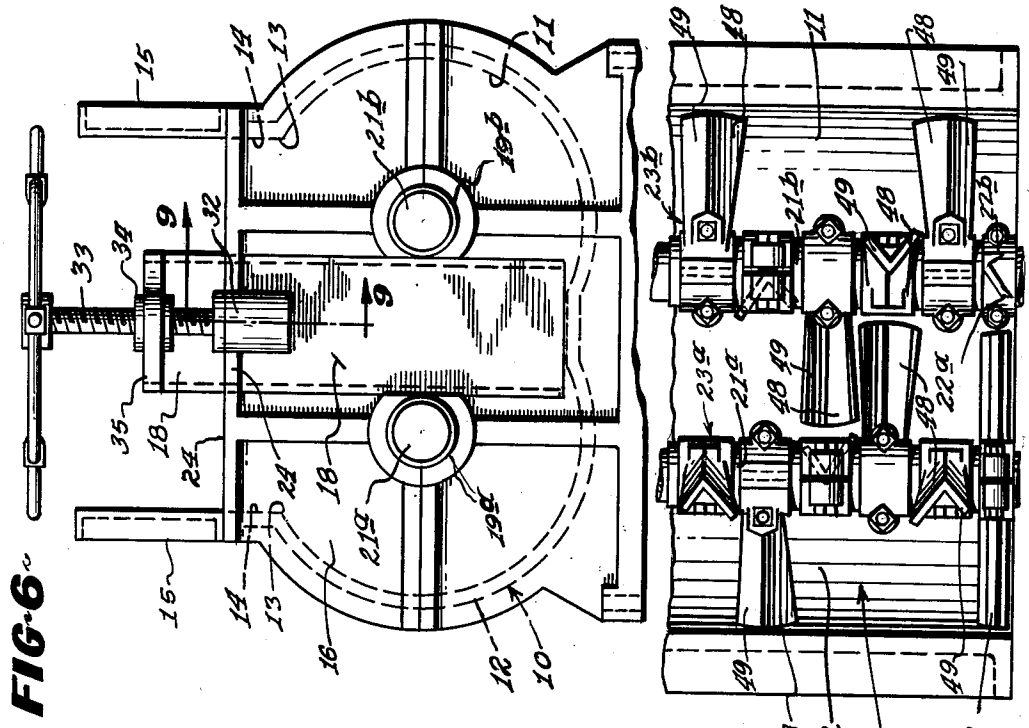


FIG-6

FIG-7

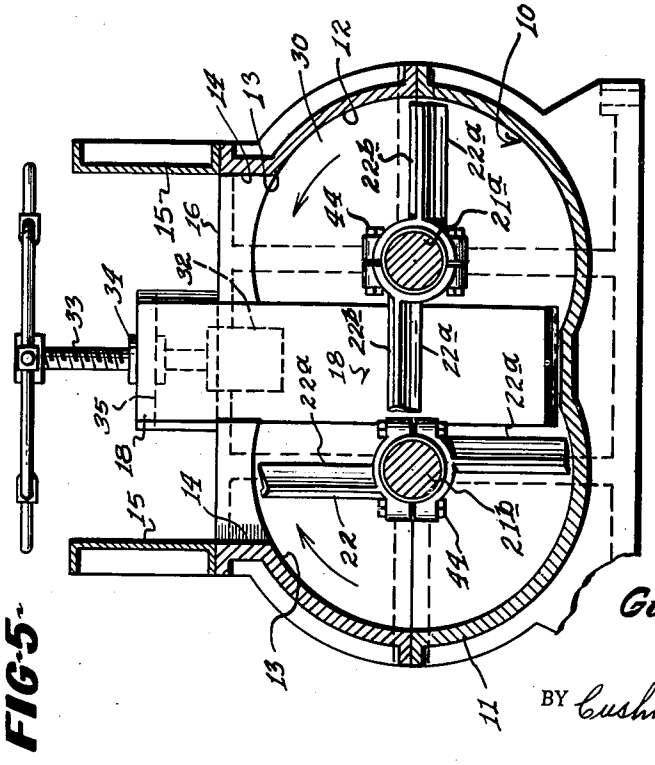


FIG-5

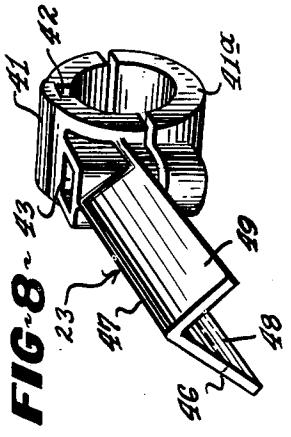


FIG-8

INVENTOR
Gustav Komarek

BY Cushman, Darby & Cushman
ATTORNEYS

Patented June 17, 1952

2,600,408

UNITED STATES PATENT OFFICE

2,600,408

FLUXING APPARATUS

Gustav Komarek, Chicago, Ill., assignor to Komarek-Greaves & Company, Chicago, Ill., a corporation of Illinois

Application January 15, 1951, Serial No. 206,035

8 Claims. (Cl. 259—6)

1

This invention relates to new and useful improvements in fluxers or masticating apparatus for preparing briquetting material.

It is well known that, in order to produce marketable birquettes, a granular material and a liquid or semi-liquid binder must be mixed to a homogeneous consistency and, furthermore, the air which has been entrapped in the granular material must be expelled so that the particles of granular material are evenly coated with binder and brought into intimate contact with each other. Moreover, the mixture must be produced in a continuous flow, the rate of which may be controlled to meet the above requirements when different grades or different materials are being prepared in the fluxer.

The primary object of this invention is to provide a fluxer in which the material is thoroughly mixed and simultaneously fed gradually throughout the entire area of the fluxing chamber toward the discharge opening thereof.

Another object is to provide a fluxer in which fluxer blades or masticators operate upon the material to expel entrapped air as well as simultaneously convey the material through the mixing chamber.

A further object is to provide a fluxer with fluxer blades or masticators which are adaptable to increase or retard the rate of flow of the material through the mixing chamber.

Further objects will be in part obvious and in part pointed out hereinafter.

The invention and the novel features thereof may best be made clear from the following description and the accompanying drawings, in which:

Figure 1 is a plan view of the fluxer and the driving mechanism thereof;

Figure 2 is a sectional view through the line 2—2 of Figure 1;

Figure 3 is a sectional elevational view along the line 3—3 of Figure 1;

Figure 4 is a sectional view through the line 4—4 of Figure 1;

Figure 5 is a sectional view through the line 5—5 of Figure 3;

Figure 6 is a side elevational view of the discharge end of the fluxer;

Figure 7 is a partial top view showing the discharge end side scrapers;

Figure 8 is a perspective view of one of the fluxer blades;

Figure 9 is a cross-sectional view through the gate screw journal box taken along the line 9—9 of Figure 6;

2

Figure 10 is a perspective view of one of the side end scrapers, and

Figure 11 is a side view of one of the side end scrapers.

Referring to the drawings, the fluxer comprises a horizontally disposed trough or mixing chamber 10, made of a plurality of cast plates forming two parallel channels 11 and 12, which are semi-circular in cross section and joined along a relatively narrow central longitudinal flat portion at the bottom, as shown in Figure 5. The upper edges 13 of the channels 11 and 12 are provided with vertical flanges 14, also as shown in Figure 5, having plates 15 secured thereto to form vertically upstanding extensions for the sides of the trough. The ends of the mixing chamber or trough 10 are closed by end walls 16 and 17, respectively, shown in Figures 6 and 4, each provided with a pair of journals 19*a* and 19*b*, 20*a* and 20*b*, for rotatably supporting two parallel shafts 21*a* and 21*b* concentrically with the semi-circular channels.

Fixedly mounted on the shafts 21*a* and 21*b*, respectively, are two series of fluxer blades 23*a* and 23*b* which are shown in Figure 1 and will be referred to in more detail below.

As viewed from the driven end of the shafts, namely from the right of Figure 1, the shaft 21*b* is driven clockwise and the shaft 21*a* counterclockwise by gear 26 on shaft 21*a*, meshing with the gear 25 on shaft 21*b* which is driven by a large reduction gear 27 mounted on shaft 21*b*. The gear 27 is, in turn, driven by gear 28 mounted on the stub shaft 29, which is driven by a suitable motor connected thereto through a suitable belt and pulley, as shown.

The end walls 16 and 17 are provided with wearing liners 30 and 31, as shown in Figure 1, each of which is inserted in a depression or recess in the respective end wall, so that the wearing surfaces of the liners are flush with the end walls. Countersunk screws are used to secure the liners in the depressions.

As shown in Figure 1, end scrapers 22, shown in detail in Figures 10 and 11, are secured to the ends of each shaft 21*a* and 21*b* and rotate, respectively, in a vertical plane adjacent each of the wearing liners 30 and 31 and between the same and the last fluxer blade or masticator 23*a*—23*b* on the end of each shaft, as shown in Figure 1. The end scraper blades at the driven ends of the shafts are offset circumferentially 180° from each other, as shown in Figure 10. Each scraper is provided with a semi-circular or half-hub for securing the scrapers to the shafts and a radially

extending blade portion disposed at an angle to the direction of rotation, as indicated in Figure 11. As shown in Figure 10, the blade portion is provided with a thin edge 22*a* and a blunt edge 22*b*, either of which may act as the leading edge of the blade.

The thin edges 22*a* of all the blades 22 at the driven end of the shafts bear against the wearing liner 31 and act as the leading edge of the blades with the pair of blades on shaft 21*a* cast "right-handed" and the pair on shaft 21*b* cast "left-handed," so that the material is scraped from the liner 31 and propelled toward the opposite or discharge end 16 of the chamber 10.

At the discharge ends 16 of the shafts, as shown in Figures 5 and 10, one of the blades 22 of each pair on the respective shafts 21*a* and 21*b* is cast "left-handed" and one "right-handed." The thin edge of the right-hand blade on shaft 21*a* acts as a trailing edge and causes the material to be forced through the gate 18, shown in Figures 5 and 6. The thin edge on the left-hand blade on shaft 21*a* acts as a leading edge, which removes material from the liner 30 and forces it in the opposite direction, i. e., towards the driven end of the shaft. The blades secured at the discharge end of shaft 21*b* are disposed in a similar manner, but because shaft 21*b* is rotating in an opposite direction to shaft 21*a*, the right-hand blade removes material from the liner 30 and forces it rearwardly, while the left-hand blade forces the material forwardly through the the gate 18.

As shown in Figures 1, 3, 5 and 6, the gate 18 is located centrally in the discharge end wall 16 of the trough 10 and consists of a flat plate having bevelled side and bottom edges which bear against complementary bevelled surfaces in the wearing liner 30, as indicated in Figure 6. Referring to Figures 3 and 6, the horizontally extending flange 24 of the end wall 16 supports a screw journal box 32. A screw 33 is rotatably supported in the journal box 32 and threadably engages the nut 34 secured to a flange 35 extending horizontally from the top of the gate 18, as shown in Figure 3. Screw 33 may be rotated by a suitable hand wheel, as shown, to cause the nut 34 to ride up or down the screw 33, thereby opening or closing the gate 18. As shown in Figure 9, the journal box 32 includes a cylindrical body having a journal or guide 36 for maintaining the end of the screw 33 in axial alignment. The shoulder 37 provides a support for the ball thrust bearing 38*a*. An annular shoulder 39 integrally formed with the screw 33 bears downwardly against the bearing 38*a* and is prevented from axial movement upwardly by a ball thrust bearing 38*b*, which is, in turn, prevented from axial movement by a bronze plate 40, secured to the journal box 32 by screws, as shown.

Each individual blade of the series of fluxer blades or masticators 23*a* and 23*b* is V-shaped in cross section and provided with an integrally formed half-hub 41, as shown in Figure 8. The half-hub 41 has a key slot 42, whereby it is keyed to a shaft 21*a*—21*b* as shown in Figure 2, and also has holes 43 which align with similar holes in the half-hub 41*a*. By means of suitable fastening means 44 and a key 45, as shown in Figures 2 and 5, the fluxer blades are fixedly secured to the shafts 21*a* and 21*b*. A similar construction is employed with the scraper blades 22, as shown in Figure 10.

On each of shafts 21*a* and 21*b*, the adjacent masticator blades are offset circumferentially 90° with respect to each other as shown in Figures 1, 3 and 7. Referring to Figure 2, the masticator blades on the respective shafts which rotate in the same vertical plane are offset 90° circumferentially.

Referring to Figures 2 and 8, each V-shaped blade 23 projects from the half-hub 41 at an angle to the axis of the shaft, e. g., at an angle to a plane passing through the free end 46 of the blade and the axis of rotation of the shafts 21*a* or 21*b*. The apex 47 of each V-shaped blade leg is thereby inclined rearwardly with respect to the direction of rotation, as shown in Figure 2. The width of the flank 48 of each blade 23 on the shaft 21*a* or 21*b* progressively increases from the hub to the free end 46, as shown in Figure 3, so that the blade area acting upon the material progressively increases from the hub. The flank 49 of each blade is of constant width throughout its length and of smaller working area than the flank 48. All the long flanks 48 on the respective shafts have their working surfaces facing toward the discharge end 16 of the mixing chamber, as shown in Figures 1 and 3. In effect, the blades comprise a pair of oppositely disposed oblique working surfaces and the blades on shaft 21*b* are "left-handed" and those on shaft 21*a* are "right-handed," with the long flank 48 of the blades on both shafts 21*a* and 21*b* facing the discharge end of the mixing chamber to direct material in that direction.

As previously described, the shafts 21*a* and 21*b* rotate in opposite directions, as shown in Figure 2. The shafts are displaced from each other a distance slightly greater than the length of the blades. As the blades plow through the material, it is caused to sweep transversely across the flanks of each blade, and as the blades on each shaft sweep by each other, the transverse thrust of each blade causes the material to be compressed. The result of this coaction of the blades approaches the action of passing the material through rollers, whereby the resultant compression force exerted on the material as it is squeezed between the blades expels entrapped air from the granular material in much the same manner as entrapped air would be expelled by a set of rollers. In addition, the plowing action of the blades causes the liquid or semi-liquid binder to evenly coat the material. Moreover, since the long flank of each blade faces the discharge end of the chamber and the summation of the transverse forces from the long flanks is greater than the summation of the forces from the short flank of each blade, the material will be caused to flow toward the discharge end 16 of the chamber.

The fluxer, as described above and shown in the drawings, operates with a maximum rate of flow toward the discharge end of the chamber because all of the fluxer blades are represented with their long flanks facing the outlet of the chamber. For most grades of briquetting material, the rate of flow is slower than this maximum. In the event that different grades of material or entirely different materials are being mixed, the rate of flow may be decreased from this maximum rate. If the rate of flow is to be decreased, several of the "right-hand" blades on the shaft 21*a* may be removed and attached to the shaft 21*b* and several of the "left-hand" blades on the shaft 21*b* may be interchanged to the shaft 21*a*, thereby changing the summation of the resultant transverse forces so that the rate of flow is materially decreased.

When the fluxer blades have been properly arranged to provide the optimum rate of flow for the particular material to be fluxed, the fluxer blades are rotated and the chamber is filled with material with the end gate 18 closed. The gate is kept closed until the material within the chamber is masticated to the proper consistency, and then opened, so that a proper amount of material is discharged continuously from the chamber to a briquetting press. That is, material is continuously fed to the masticator and the latter operated to continuously discharge the masticated material. The rate of travel of material through the masticator is controlled by the blades as above described and the rate discharge of masticated material is regulated by the opening of the gate 18.

While this improved fluxer construction is primarily intended for use in masticating briquetting material, such as fuel, iron ore, etc., it is also applicable for mixing various other materials, and, although the preferred form is herein shown, it is obvious that various changes and substitutions may be made without departing from the spirit of this invention.

I claim:

1. In a fluxer, a plurality of parallel horizontally disposed shafts, a series of masticators fixed to said shafts and operable in vertical planes, each of said masticators being V-shaped in transverse cross section and having flanks of unequal width.

2. In a fluxer, an end wall having an outlet, a plurality of horizontally disposed shafts, a series of masticators interchangeably fixed to said shafts and operable in vertical planes, each of said masticators being V-shaped in transverse cross section and having flanks of unequal width, a major number of the greater width flanks having their working surfaces facing toward said outlet.

3. In a fluxer, a plurality of counter-rotating horizontal shafts, a series of masticators interchangeably fixed to said shafts and operable in vertical planes, each of said masticators being V-shaped in transverse cross section and having flanks of unequal width, the wider flank of each masticator having its surface facing toward the outlet of the fluxer.

4. A fluxer comprising in combination a horizontally disposed casing, and a pair of counter-rotating horizontal shafts journalled at each end to said casing, a series of masticators fixed to said shafts and operable in vertical planes, each of said masticators being V-shaped in transverse cross section and having flanks of unequal width, an outlet at one end of said chamber between said shafts, the surface of the wider flank of each masticator facing toward the outlet, and a gate for controlling discharge of material through the outlet.

5. In a fluxer, a plurality of horizontally disposed spaced-apart shafts, and a series of V-shaped masticators fixed to said shafts, the apex of each of said V-shaped masticators being

operable in a vertical plane and inclined rearwardly with respect to the direction of rotation, one flank of each masticator being of progressively increased width along its longitudinal axis and providing a larger working surface than the other flank.

6. In a fluxer, a plurality of parallel horizontally disposed shafts, and a series of masticators operable in vertical planes and fixed to said shafts, each masticator comprising a V-shaped blade having oppositely disposed oblique working surfaces, the apices formed by said surfaces operating in parallel vertical planes and said blades extending at an angle to the longitudinal axis of said shaft, each of said masticators having one of said oblique surfaces less in width than the other surface.

7. In a fluxer, a plurality of parallel horizontally disposed shafts, a series of masticators fixed to said shafts and operable in vertical planes, each of said masticators being V-shaped in transverse cross section, one flank of each masticator increasing progressively in width toward the free end thereof with the second flank of substantially equal width throughout its length.

8. A fluxer having a horizontally disposed casing with an open top and inlet and outlet end walls, the end wall provided with the outlet having a vertically slidable gate therein, horizontal shafts journalled to the end walls and disposed at the outlet on each side of the gate, masticators fixed to said shafts and operable in vertical planes, each of said masticators being V-shaped in transverse cross-section and having a long flank and a short flank with all the long flanks disposed toward the outlet, whereby the material in the fluxer is conveyed toward said outlet, and a pair of scraper members respectively fixed to the ends of each shaft at the end walls, the faces of the two pairs of scrapers at the inlet ends of the shafts being inclined relative to their direction of rotation so that material is scraped from the inlet end wall and conveyed towards the outlet, and with the faces of one blade of each pair at the discharge end of the shaft inclined relative to their direction of rotation so that material is forced through the outlet and the faces of the other blade of each pair at the discharge end of the shafts inclined relative to their direction of rotation so that material is scraped from the discharge end wall and forced toward the inlet end wall.

GUSTAV KOMAREK.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
941,767	Dickson	Nov. 30, 1909
1,430,384	Komarek	Sept. 26, 1922
1,450,900	Holthoff	Apr. 3, 1923
1,727,992	King	Sept. 10, 1929