Feb. 13, 1923. 1,444,910

J. F. GOETZ

MIXING APPARATUS

Filed Feb. 20, 1922 2 sheets-sheet 1

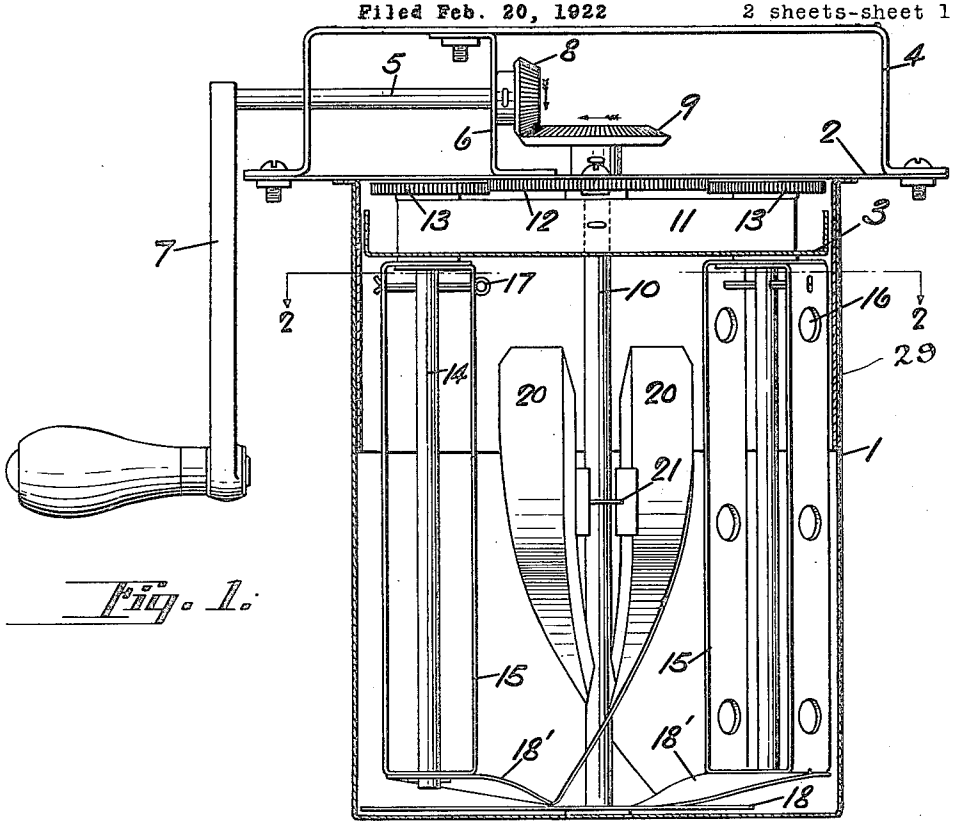


Fig. 1.

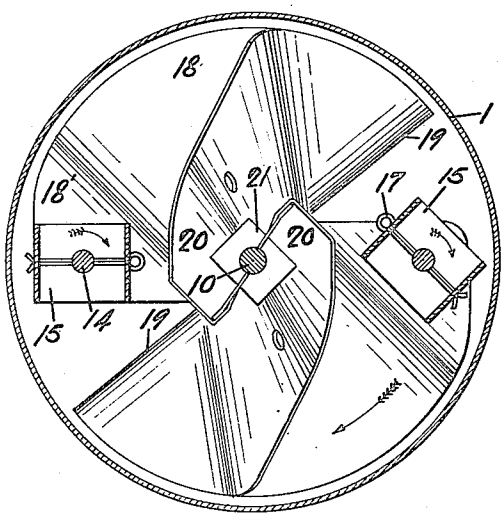


Fig. 2.

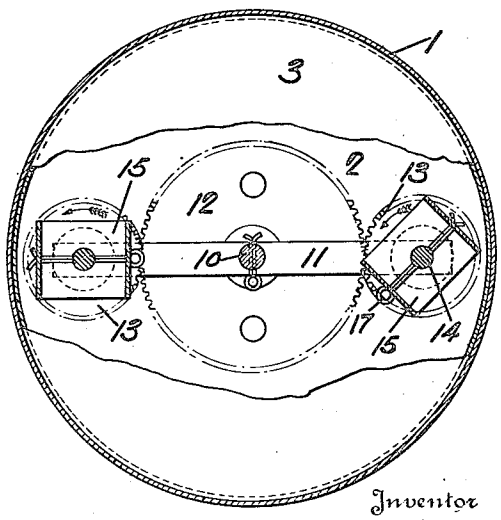


Fig. 3.

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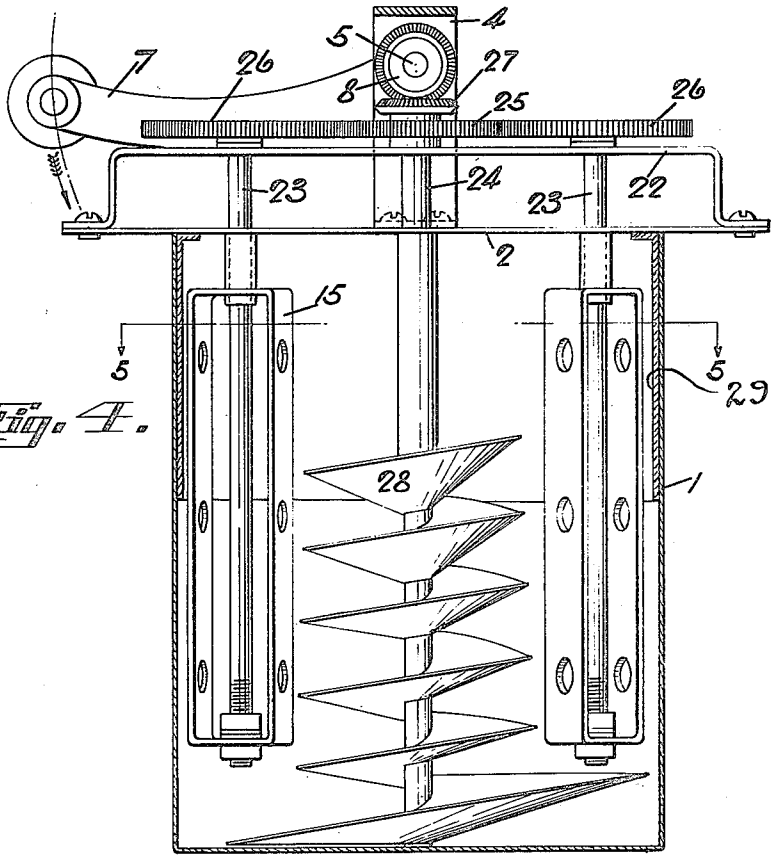


Fig. 4.

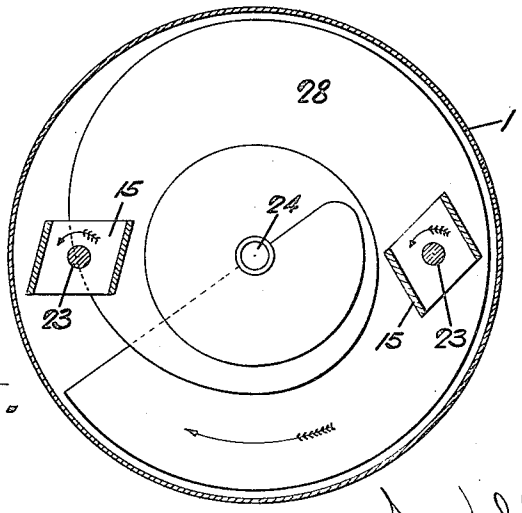


Fig. 5.

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Patented Feb. 13, 1923. 1,444,910

UNITED STATES PATENT OFFICE.

JOSEPH F. GOETZ, OF DAYTON, OHIO.

MIXING APPARATUS.

Application filed February 20, 1922. Serial No. 537,782.

To all whom it may concern:

Be it known that I, JOSEPH F. GOETZ, a citizen of the United States, residing at Dayton, in the county of Montgomery and State of Ohio, have invented certain new and useful Improvements in Mixing Apparatus, of which the following is a specification.

My invention relates to mechanical agitators and more particularly to not only an apparatus for mechanically stirring liquids or semi-liquid materials, but to means for automatically elevating or lifting the heavier and more dense portions of the material and discharging it at a high level simultaneously with the stirring operation.

The invention contemplates an apparatus to be inserted within a vessel such as a paint bucket for which the head of the agitating apparatus will form a lid or closure, from which closure head depends rotary agitators or stirrers, and in conjunction therewith a spiral or helical elevator, the lower convolution of which extends in close proximity to the bottom of the vessel or bucket and is sufficiently enlarged radially to extend beneath the stirrer or agitator to approximately the side walls of the vessel whereby the lower extremity of such elevator will serve somewhat in a capacity of a scraper for loosening and collecting the heavy dense matter, and carrying it upwardly through the spiral conveyor for discharge near the top of the vessel, where it will be thoroughly intermixed with the less dense liquid by the agitation of the stirring elements.

The object of the invention is to simplify the structure as well as the means and mode of operation of stirring and agitating apparatus whereby it will not only be cheapened in construction, but will be more efficient in use, positive in action, uniform in operation, easily operated and unlikely to get out of repair.

A further object of the invention is to provide means for mechanically lifting solid or dense portions of a mixture and discharging the same in proximity to the agitating devices.

A further object of the invention is to provide improved means for actuating such agitating or stirring mechanism whereby every portion of the body of material operated upon will be uniformly affected.

With the above primary and other incidental objects in view as will more fully appear in the specification, the invention consists of the features of construction, the parts and combinations thereof and the mode of operation, or their equivalents as hereinafter described and set forth in the claims.

In the accompanying drawings, wherein are shown the preferred, but obviously not necessarily the only forms of embodiment of the invention, Fig. 1 is a vertical sectional view of a vessel or receptacle having the apparatus forming the subject matter hereof applied thereto. Fig. 2 is a transverse sectional view substantially on line 2—2 of Fig. 1 looking downward. Fig. 3 is similar sectional view looking upwardly or as a bottom plan view of the driving mechanism. Fig. 4 is a side elevation of a modified form of the apparatus. Fig. 5 is a transverse sectional plan view substantially on line 5—5 of Fig. 4.

Like parts are indicated by similar characters of reference throughout the several views.

When many materials such as paint and coloring matter in solution as well as various chemical preparations and mixtures of semi-liquid character are allowed to set for protracted periods of time, the heavier or more dense ingredients not held in solution have a tendency to settle to the bottom of the container or receptacle forming therein a semi-solid or plastic body, while the lighter or more fluid portions of the mixture will rise to the top of the vessel. When remixing such material for use a mere stirring of the liquid portion is not always sufficient to thoroughly intermix the solid material, and the mere agitation of the liquid is not sufficient to break up and cause a circulation of the heavier particles through the entire body. The present apparatus is designed to collect and mechanically elevate this heavier portion of the mixture, discharging it near the top of the vessel at a high level and in proximity to the agitators whereby it will be thoroughly stirred and intermixed to afford a liquid or mixture of uniform density throughout.

In the accompanying drawings, 1 is a vessel or receptacle such as a standard paint bucket. The agitating and mixing apparatus forming the subject matter hereof is mounted upon a closure plate 2 adapted to overlie the top of the vessel or receptacle 1 and to which is united a dependent circular

housing 3, which projects within the vessel or receptacle 1, serving to locate the agitating apparatus concentrically therein and also prevent splashing or escape of the mixture beneath the closure plate 2. Secured to the closure plate 2 is an arched shaped bar 4, which not only forms a support and bearing for the drive shaft 5, but also serves as a handle or bail to facilitate the insertion of the apparatus in a bucket or vessel of paint or other commodity and its removal therefrom. The drive shaft 5 has a second bearing in a strut 6, interposed between the closure plate 2 and the bail or handle bar 4. The drive shaft 5 has been shown provided with an operating crank 7 at its outer end, but it is obvious that in lieu of manual operation this shaft may be provided with a drive pulley for operative connection with a power motor. At its inner end the shaft 5 carries a bevel pinion 8 intermeshing with a second gear pinion 9, upon the upper end of a vertically disposed shaft 10. This shaft 10 is journalled in the closure plate 2, and the bottom wall of the housing 3, and carries within the housing 3 fixedly secured upon shaft a cross arm 11.

Stationarily secured upon the inner or bottom face of the closure plate 2 by riveting or otherwise is a stationary spur gear ring 12, positioned concentrically with the shaft 10.

This stationary gear member 12 comprises one member of a planetary gear train, the planetary pinions of which are mounted upon the upper ends of agitator shafts 14, journalled in the outer end of the cross arm 11, in such relation that the planetary pinion 13 intermesh with the stationary gear member 12. The construction is such that as the shaft 10 is rotated by means of the drive shaft 5, and with it the cross arm 11 the intermeshing engagement of the planetary pinion 13 with the gear 12 will effect a simultaneous rotation of the agitator shafts 14 about their own axis simultaneously with their travel in their orbit around the main shaft 10. The agitator shafts 14 may be provided with any suitable stirring devices, such as blades, radially disposed fingers, spirals, handles or other such devices. However, for economy of manufacture and simplicity of operation, these agitator shafts have been shown as provided with rectangular stirring frames comprising parallel spaced bars or strips extending longitudinally on opposite sides of the shaft and interconnected at their upper and lower ends to form a parallelogram. To further increase the agitation these stirring frames or agitators 15 have been shown provided with spaced holes 16. The frames are connected to turn with the shaft 14, as for instance by transverse cotter pins 17 or other suitable interconnecting means.

Carried upon the main shaft 10 intermediate the agitator frame 15, is a helical or spiral elevator comprising an enlarged head portion, 18, in this instance of duplex character, comprising two sector like portions 18′, the advance edges 19 of which are deflected downwardly to extend into proximity to the bottom of the vessel and function as scrapers or collectors for the heavy dense or partially solidified material. The radial extent of the head 18 is almost equal to that of the vessel or receptacle 1. This collecting and elevating device covers substantially the entire bottom of the vessel, extending beneath the agitators or stirrers 15. The agitator shafts 14 are preferably provided with bearings for their lower ends in the sectors 18′ of the elevator head. These shafts are interconnected with the head of the conveyor or elevator, adjacent to the rear edges of the sector shaped portion, or almost diametrically opposite the scraping or collecting head 19. Attached to the head portion 18 of the elevator intermediate the advance collecting edges 19, and the point of engagement of the agitator shafts 14, and extending upwardly and helically therefrom are two tapered or evolute conveyor blades 20. These blades are supported further by a transverse interconnecting tie 21, which surrounds and connects them with the shaft 10. In the drawings, these blades have been shown arranged quite steeply or upon a long pitch. It will be understood that the pitch of the blades may be varied according to the character of the material, or the conditions of use to which the apparatus is to be adapted. It is to be noted that while the radius of the spiral conveyor or elevator is comparatively small at the top being substantially half the radius of the field of action of the agitator or stirrers 15, the helical elevator or conveyor blades gradually widen downwardly merging into the head 18, which covers substantially the full area of the bottom of the receptacle. The material collected from the bottom of the receptacle by the head 18, will be forced upwardly by the rotation of the helical blades, which due to their gradually narrowing radius will progressively feed the collected material into the surrounding liquid, the distribution being uniformly carried on throughout the length of the spiral. This discharge from the conveyor being in close proximity to the rotating agitators 15, the material will be thoroughly mixed and any unmixed particles which then settle to the bottom will be recollected and again carried upwardly, and discharged from the spiral conveyor into the vortex of the whirling agitators. As before mentioned these agitators not only rotate upon their own axis, but are constantly traveling in a circular path around the spiral conveyor, so

that every portion of the body of liquid is thoroughly agitated.

In Fig. 4 there is shown a modification of the construction heretofore described, whereby in lieu of the planetary action of the agitators or stirrers, these members rotate upon fixed axes, while the spiral elevators which in this instance is shown as a single evolute helix having but one collecting or scrapping edge is shown as of much shorter pitch.

Referring to Fig. 4 wherein the vessel or receptacle 1 receives and supports the apparatus mounted upon the closure plate 2, to which is attached the scale or arch shaped bar 4 as before described, the closure plate 2 is provided with a second arched bar 22 of less height than the arch or bail 4 and arranged at right angles or transversely thereto. The stirrer shafts 23 are journalled in this frame bar 22, and the closer lid 2, as is also the main shaft 24. The main shaft 24 carries on its upper end a double faced gear having a series of spur gear teeth 25 with which mesh the gears 26, upon the stirrer shaft 23, and also a second series of bevel gear teeth 27, with which meshes the driving gear pinion 8 upon the drive shaft 5.

While any suitable form of blade, paddle, spirals, fingers or other stirring elements may be mounted upon the agitator shaft 23 the same type of frame like agitator has been shown in this view as previously described. These agitator frames 15 rotate with the shaft 23, but in this construction retain their relative positions within the vessel 1, instead of traveling in a circular path. While only two of these agitator shafts 23, and carrying members 15 have been shown in Fig. 4 it will obvious that any number of these devices may be located in different radial positions, about the central or main shaft 24, with their driving gear pinions 26 intermeshing with the central gear 25. Mounted upon the main shaft 24, is the evolute helical conveyor 28, the radius of which gradually reduces upwardly as is quite plain in Fig. 5. The lower or large end of this conveyor extends in close proximity to the bottom of the vessel or bucket 1, and collects the heavy particles of material carrying them upward in the conveyor and distributing them gradually throughout their path of travel. The distributed or discharged heavy particles are caught in the vortex of one of the adjacent agitators 15, and thoroughly intermixed with the solvent liquid. In this particular construction the agitator shafts 23 have been shown dependent within the vessel 1 from the closure lid 2, but without any support or connection at their lower end, whereas in the construction shown in Fig. 1 they are interconnected with the spiral conveyors, and so supported at their lower extremity.

The helical elevator will have a boring or auger like action, but which will cut into and break up the solidified or semi-solid materials, in the bottom of the vessel. To facilitate this action, the radial edge of the lowermost convolution of the elevator is sharpened or is of reduced thickness to afford a cutting action. While paints and other such products will separate when left standing for long periods of time, the lead being precipitated to the bottom of the vessel, and the oil rising to the top, other products such as wall tints containing lithopone are much more difficult to remix than are paint. This is due to the fact that while lithopone is not so heavy as the lead contained in the paint, it will solidify or cake much more harder in the bottom of the vessel. The helical elevator has a scraping or cutting action upon such deposits, thereby sub-dividing the solid or semi-solid mass. These portions raised by the elevator are then beaten and further broken up or pulverized by the rotary mixer until such precipitate is again held in a state of suspension. In the case of paint and other like products having a semi-solid precipate, the elevator will cut or separate this into portions easily acted upon by the agitators or mixers. With the ordinary process of stirring paint by means of a paddle, such precipitate forms a sticky mass or ball, which is quite difficult to separate and redistribute through the liquid. This difficulty is overcome by the present device.

In view of the fact that when the precipitate is solidified or in a semi-solid condition, the apparatus can not be at once inserted to the full depth of the vessel, the lid or cover portion has been shown provided with a deep dependent flange 29. This flange 29 will project within the walls of the vessel when the apparatus is in its initial elevated position, and resting upon the deposit in the bottom of the vessel. As the apparatus is operated, and the elevator performs its auger like cutting or boring action upon the caked or solidified precipitate, the apparatus is progressively lowered within the vessel until ultimately the elevator operates in close proximity to the bottom of the vessel as shown in the drawings. The dependent lid flange 29 is of such length as to form an effective closure with the apparatus in various stages of elevation.

From the above description it will be apparent that there is thus provided a device of the character described, possessing the particular features of advantage before enumerated as desirable, but which obviously is susceptible of modification in its form, proportions, detail construction and arrangement of parts without departing

from the principle involved or sacrificing any of its advantages.

While in order to comply with the statute the invention has been described in language more or less specific as to structural features, it is to be understood that the invention is not limited to the specific details shown, but that the means and construction herein disclosed comprises the preferred form of several modes of putting the invention into effect, and the invention is therefore claimed in any of its forms or modifications within the legitimate and valid scope of the appended claims.

Having thus described my invention, I claim:

1. In an agitating apparatus, to be suspended in a vessel, a lid for the vessel, a centrally disposed helical elevator, suspended from said lid, a plurality of rotary mixers suspended from the lid in different radial positions eccentric in relation with the helical elevator, and means for simultaneously rotating the elevator and said mixers to elevate the dense material from the bottom of the vessel by the action of the helical elevator and agitating such material as it is discharged from the elevator by the rotation of the mixers.

2. In an agitating apparatus to be suspended in a vessel, a supporting structure forming a cover for the vessel, a tapered helical conveyor suspended from said cover, the lower convolution of which extends into proximity to the bottom of the vessel, and collects the precipitated dense material, the convolutions of the helical elevator progressively decreasing in diameter in an upwardly direction whereby the material collected by the lowermost convolution is progressively discharged at different elevations, and means for actuating the elevator.

3. In an agitating apparatus to be mounted in a vessel, a supporting structure, a centrally disposed revoluble shaft, a scraper head carried at the lower end of the shaft and operating over substantially the full area of the bottom of the vessel, and a continuous helical conveyor carried by the shaft adapted to elevate the material collected by said scraper head from the bottom of the vessel, said conveyer being caused to progressively distribute at various elevations the material collected.

4. In an agitating apparatus to be positioned in a vessel, a supporting structure, a helical elevator extending within the vessel, and adapted to elevate the dense portions of material from the bottom of the vessel, and auxiliary mixers rotating upon axes eccentric with said elevator the field of action of which intercepts that of the elevator and causes currents of material to pass interchangeably from the elevator to the vortex of the mixer and vice versa to agitate the material discharged from the elevator, and means for simultaneously actuating the elevator and mixers.

5. In an agitating apparatus to be suspended in a vessel, a supporting structure forming a cover for the vessel, a helical elevator suspended within the vessel proportioned and arranged to discharge at different levels the dense material collected from the bottom of the vessel, and auxiliary agitators mounted for rotation in proximity to the elevator for agitating the discharged material, and means for simultaneously actuating the elevator and mixers.

6. In an agitating apparatus of the character described, the combination with a vessel of means insertable within the vessel for inducing a central upwardly directed current of material to be agitated and stirring elements positioned eccentrically in relation with the centrally disposed rising current, inducing a descending vortex having constant intermingling communication with the upwardly directed current, whereby material is drawn fom one to the other, at various levels.

7. In an apparatus of the character described, means insertable within a vessel for collecting material from the lower portion of the vessel and conveying it upwardly and mixers, the field of operation of which intercepts that of the collecting and conveying means for agitating the elevated material upon its release from said collecting and conveying means.

8. In an agitating apparatus, an elevator insertable centrally within a vessel, a plurality of rotary mixers located eccentrically in relation with said conveyor and means for actuating the elevator and simultaneously transmitting planetary motion to the mixers whereby said mixers will move in an orbit about the elevator simultaneously with their rotation about their own axes.

9. In an agitating apparatus to be mounted within a vessel, an elevator for acting upon an unconfined body of material within the vessel and a rotary agitator in proximity to the elevator, the field of action of which intersects that of the elevator whereby the material carried by the elevator will be drawn therefrom into the vortex of the agitator at different elevations, and means for simultaneously rotating the elevator and agitator.

10. In an agitating apparatus, a centrally disposed helical elevator and a plurality of rotary mixers positioned eccentrically in different radial positions about the elevator insertable within a vessel and means for simultaneously actuating the elevator and mixers.

11. In an agitating apparatus, a helical elevator adapted to progressively discharge at different levels, and a mixer eccentrically

positioned in relation with the elevator adapted to agitate the discharge material and means for simultaneously rotating the elevator and mixer.

12. In an agitating apparatus, a centrally disposed helical elevator, a transverse arm carried by the elevator, rotary mixers mounted in said arm, gear pinions carried by said mixers, and a stationary gear member with which the mixer gears intermesh whereby upon rotation of the helical elevator, the mixers will be simultaneously rotated while being carried in a path of travel concentric with the elevator.

13. In an agitating apparatus to be mounted in a vessel, two revoluble elements eccentrically mounted for rotation about substantially parallel axes, one of which forms an ascending vortex and the other a descending vortex the fields of influence of which overlap whereby material will pass from one vortex to the other at various elevations, and means for rotating said elements.

14. In an agitating apparatus of the character described, a rotary elevator and a rotary mixer eccentrically positioned in such relation that their vortices will intercept each other whereby a continuous distribution of material will be induced from the elevator to the mixer throughout a considerable extent of the elevator, and means for simultaneously rotating the elevator and mixer.

In testimony whereof, I have hereunto set my hand this 11th day of February A. D. 1922.

JOSEPH F. GOETZ.

Witnesses:
HARRY F. NOLAN,
GEORGE C. HELWIG.