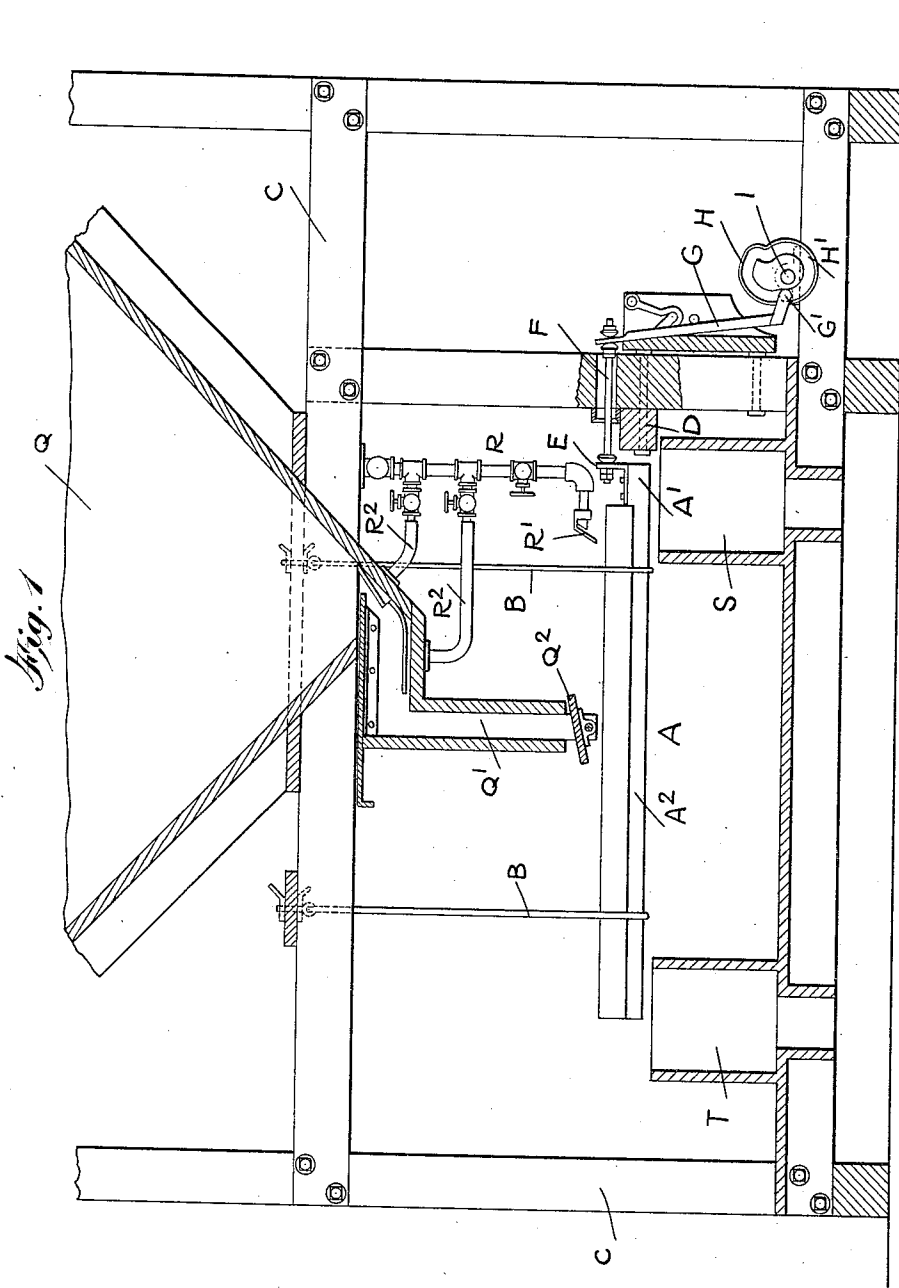


A. C. CAMPBELL.
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 APPLICATION FILED JUNE 5, 1912.

1,065,213.

Patented June 17, 1913.

3 SHEETS—SHEET 1.



WITNESSES
F. D. Sweet
W. G. Hester

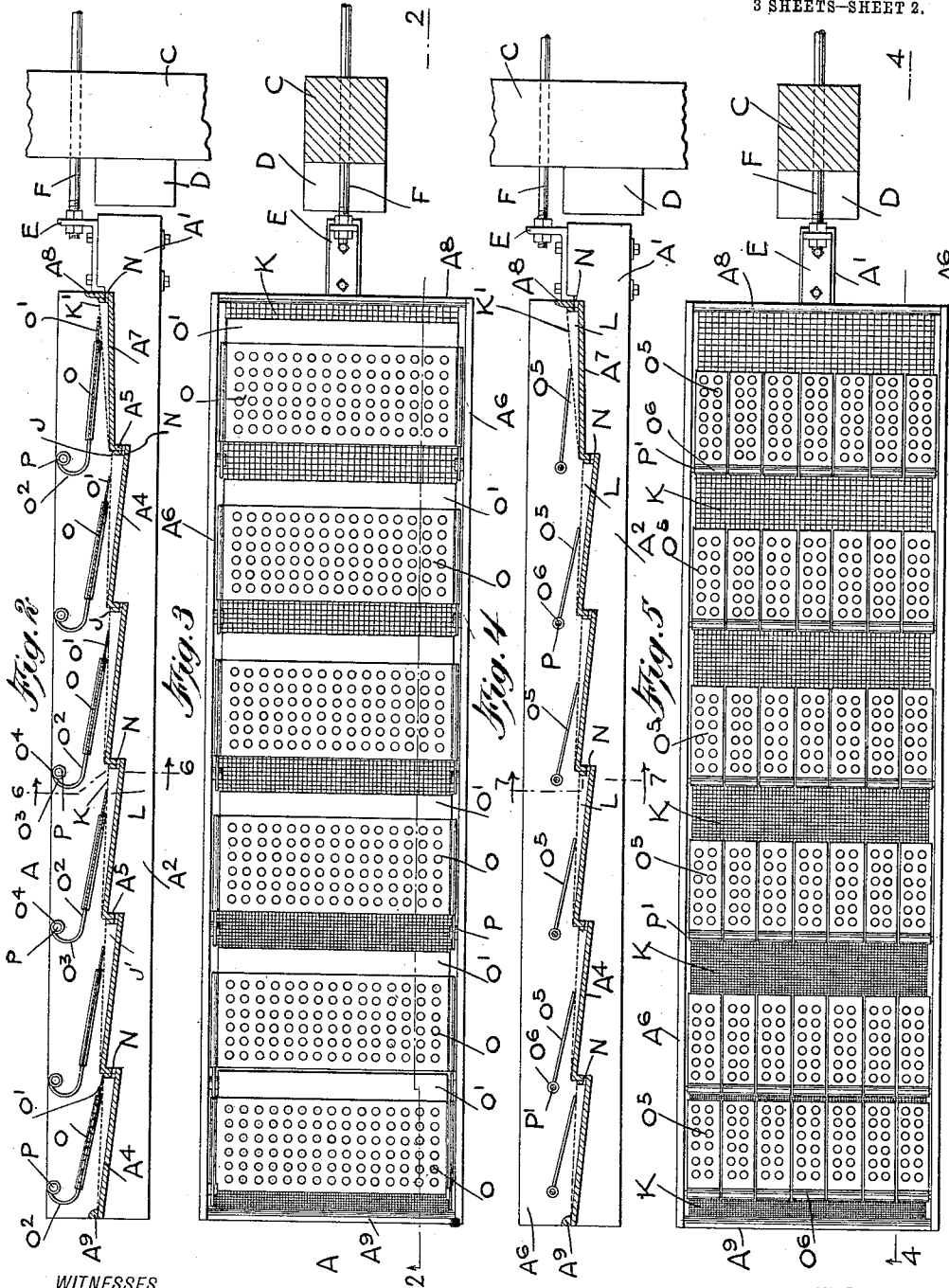
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3 SHEETS—SHEET 3.

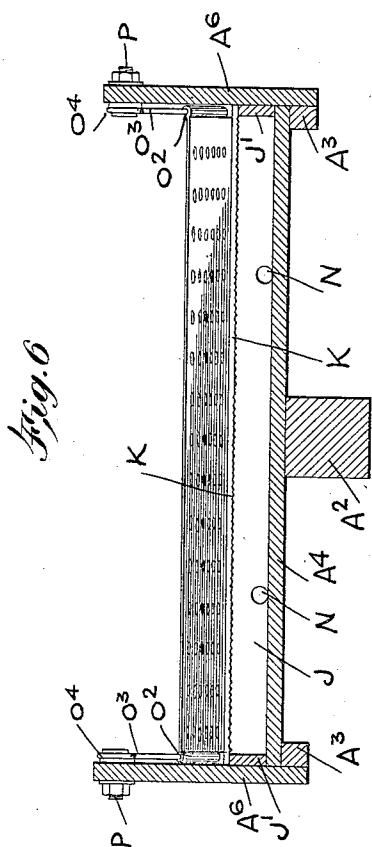


Fig. 6

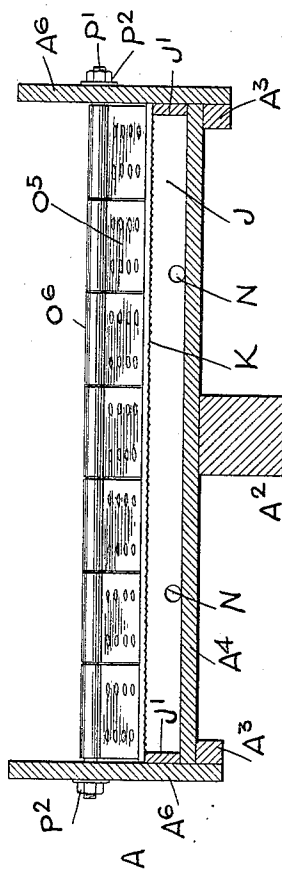


Fig. 7

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UNITED STATES PATENT OFFICE.

ALONZO C. CAMPBELL, OF ASHEVILLE, NORTH CAROLINA.

COAL-WASHER AND ORE-CONCENTRATOR.

1,065,213.

Specification of Letters Patent.

Patented June 17, 1913.

Application filed June 5, 1912. Serial No. 701,788.

To all whom it may concern:

Be it known that I, ALONZO C. CAMPBELL, a citizen of the United States, and a resident of Asheville, in the county of Buncombe and State of North Carolina, have invented a new and Improved Coal-Washer and Ore-Concentrator, of which the following is a full, clear, and exact description.

The invention relates to coal washers and ore concentrators, such as shown and described in the Letters Patent of the United States, No. 695,790, No. 835,397, and No. 898,314, granted to me on March 18, 1902, November 6, 1906 and September 8, 1908, respectively.

The object of the present invention is to provide a new and improved coal washer and ore concentrator arranged to prevent back sliding such densities of the material under treatment as should go forward, and to insure the movement of all the material in the proper directions so that the capacity of the machine is increased as the working surface has a great jigging and panning effect to hasten concentration and also to hasten on discharge of heads.

For the purpose mentioned use is made of a pan, means for oscillating the pan and imparting a percussive action to the same, the said pan having a working surface made in sections inclined forwardly and downwardly to cause the concentrates to flow by gravity forwardly to the point of discharge while the tailings and water flow by gravity rearwardly into the tailings discharge.

A practical embodiment of the invention is represented in the accompanying drawings forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views.

Figure 1 is a sectional side elevation of the coal washer and ore concentrator, the pan being shown in elevation; Fig. 2 is an enlarged sectional side elevation of the pan provided with one form of riffles, the section being on the line 2—2 of Fig. 3; Fig. 3 is a plan view of the same; Fig. 4 is a sectional side elevation of the pan provided with another form of riffles, the section being on the line 4—4 of Fig. 5; Fig. 5 is a plan view of the same; Fig. 6 is an enlarged cross section of the pan shown in Figs. 2 and 3, the section being on the line 6—6 of Fig. 2; and Fig. 7 is an enlarged cross sec-

tion of the pan shown in Figs. 4 and 5, the section being on the line 7—7 of Fig. 4.

Successful operations of washers as heretofore constructed have been balked to a considerable extent by the accumulation of a large body of material of different densities that would neither move one way nor the other or would travel forward and backward and never discharge either at the head or the tail of the machine thus over-burdening the pan for no good purpose. In order to overcome this difficulty and to insure movement of all the material in the proper and desired direction and thus increase the working capacity of the machine is the main object of the improvements presently to be described in detail.

The pan A is hung on suspending rods B depending from the main frame C of any approved construction, and the said pan A is provided with a head block A' adapted to bump against the bumping block D held on the main frame C, and the said head block A' is provided with a flange E connected by a connecting rod F with the upper end of a forwarding lever G carrying at its lower end a friction roller G' engaging the cam groove H' in a cam wheel H attached to the main driving shaft I journaled in suitable bearings on the main frame C and connected by pulleys and belts or other devices with machinery for imparting a continuous rotary motion to the said shaft I. The detailed construction of the forwarding lever G is approximately the same as the one shown and described in the Letters Patent of the United States, No. 695,790, above referred to, so that further description of the same is not deemed necessary.

The pan A is constructed in detail as follows, special reference being had to Figs. 2 to 7. The head block A' previously mentioned forms part of a keel or a longitudinally-extending rib A², cut out on the top in the form of saw teeth and similarly cut side bars A³ on opposite sides of the keel A² form with the latter a support for the bottom pieces A⁴ resting on the inclined cut-out portions of the keel A² and the bars A³. The forward ends of the bottom pieces A⁴ support cross bars to form barriers A⁵. The sides A⁶ of the pan A are secured to the side bars A³ and the sides of the bottom pieces A⁴, as will be readily understood by

reference to Fig. 6. On the inner faces of the barriers A^5 and resting on the bottom pieces A^4 are secured transverse strips J , and triangular-shaped strips J' extend longitudinally along the sides A^6 of the pan and likewise rest on the bottom pieces A^4 . The strips J and J' form supports for the forward ends of the sides of screens K , K' passing at their rear ends to the rear ends of the bottom pieces A^4 , thus forming with the latter and with the barriers A^5 hutch pockets L from which lead openings N formed in the cross strips J and the barriers A^5 . The foremost bottom piece A^7 is inclined in the reverse direction to the bottom pieces A^4 , that is, the latter are inclined forwardly and downwardly while the front or head bottom piece A^7 is inclined downwardly and rearwardly, and the screen K' overlying this upper bottom piece A^7 is inclined downwardly and rearwardly in contradistinction to the forward and downward inclination of the other screens K . An apertured barrier A^8 is arranged on the forward end of the head bottom piece A^7 and a similar barrier A^9 is arranged on the rear end of the last bottom piece A^4 for the passage of the tailings from the pan A , as hereinafter more fully explained. The screens K and K' are preferably constructed with meshes gradually increasing in size from the tail end of the pan to the head end thereof, as plainly indicated in Figs. 3 and 5. Within the pan A are arranged transversely-extending perforated riffles O inclined forwardly and downwardly, and each terminating at its forward end in a flap valve O' , riveted or otherwise secured to the body of the riffles O , the free end of the flap valve O' resting on the corresponding screen K or K' and at a point intermediate the ends thereof. The sides of each riffle O are bent around longitudinally-extending rods O^2 having rearwardly-curved spring extensions O^3 terminating in eyes O^4 engaged by bolts P held transversely in the sides A^6 of the pan A , as plainly shown in Fig. 6. By the arrangement described the riffles O are free to swing up or down owing to the spring extensions O^3 permitting the supporting rods O^2 for the riffles O to flex. By the use of the spring extensions O^2 a tension resistance is provided for each riffle O to hold the latter against the free upward swinging movement, that is, to hold the flap valves O' with a desired force in contact with the jig screens K .

In the modified form of riffles shown in Figs. 4, 5 and 7, each riffle is made in sections O^5 arranged one alongside the other in a transverse direction, and each terminating at its rear upper end in an eye O^6 through which extends a rod P' which extends through the sides A^6 of the pan and

is fastened thereto by nuts P^2 . By the arrangement described the sections of each riffle O^5 are free to swing up or down one independent of the other instead of the entire riffle O swinging up and down. The construction of the pan provided with the riffles O^5 is the same as above described in reference to the riffles O , so that further description of the modified form shown in Figs. 4, 5 and 7 is not deemed necessary. The material to be treated is placed into a hopper Q mounted on the frame C and having an outlet spout Q' provided with a pivoted tilter Q^2 for delivering the material to the pan A , preferably one-third of the distance from the head of the pan A . A water supply pipe R connected with a suitable source of water is provided at its outlet with a spreader R' to distribute the water at the head of the pan A . A portion of the water is also passed by branch pipes R^2 to the hopper Q . The material passing out of the end of the pan A drops into a sluice S while the tailings pass over the tail end of the pan A and drop into a tailings sluice T , both sluices S and T being mounted on the main frame C .

When the machine is in operation the pan A is oscillated and receives a percussive action by the mechanism shown and described, and by this action of the pan the more dense stuff is caused to settle to the bottom and to adhere with some degree of persistency to the fixed screens K . At the head of each hutch pocket L nearest the barrier A^5 the flow or buoyancy of the material is greatest, diminishing rapidly and disappearing at the tail or rear end of each individual pocket L , with the general effect to gradually enrich the overlying bed of material as the latter travels forward on each individual screen K . The action described is the first step in the process of concentration. The more massive bed of the dense stuff or that which clings more persistently to the screens K bumps forward uninterruptedly, and passes under the swinging riffles, trap-like, and onto another series of riffles O , more persistently massive toward the head discharge. Portions of the feed stuff of finer grain and less dense undergoes more or less of over and under circuitous flow and diffusion with the water. It will not cling so persistently to the screens. At this juncture, the perforate swinging riffles O come into play to arrest the too precipitate flow of the diffused mass. Sedimentation will take place on the inclining areas, and the buoyant effect of this water intermittently lurched through the jig areas will cause a second or a re-washing of the material, peculiarly modified, as will appear presently. The fine dense stuff passes through the perforations of the riffles O and intermingles and masses with the under

trend accumulating from riffle to riffle and finally discharging at the head. That portion that cannot go through the perforations, being too large or too light, is jigged to that extent that the light stuff, coal or gangue, drifts with the water to the tail end of the machine and discharges over the barrier A' into the tailings sluice T. That part of the material which is more dense moves down the inclined riffles O by the fourfold effect produced, first, by gravity, second, by impact; third, by the buoyancy of the water flowing up through the perforations of the riffles; and, fourth, by the lodgment from the water filtering back through the perforations instead of overflowing the upper ends of the riffles. The latter action seems to be the most effective to prevent backsliding, which is most damaging in washers as heretofore constructed. The fourfold effect referred to, to retard backsliding of such densities as should go promptly to the head, constitutes the main feature of the present improvement, it being understood that the capacity of the machine, particularly on fine stuff, is twofold with greater enrichment of headings and of tailings of ore or of coal. It will also be noticed that the working surface has great jigging and panning effect to hasten concentration and also to hasten prompt discharge of headings. Owing to the many safeguards against backsliding of the values, the pan A may have much greater inclination or a fall, thus favoring a more rapid discharge of the tailings.

The flap valve O' on the lower margin of each riffle O forms a safeguard to prevent back flow of the water under the corresponding riffle, and the flap valve also serves as a favorable lodgment for the fine dense stuff that would otherwise be buoyed by the too violent upflow and the uplift of the riffle at each bump of the pan. The flap valve also serves to hold down the spacing under the riffle to the most suitable gage by the weight of the superincumbent mass that is not diffused by the water.

By using multiple riffles more pliability is given to the machine and the latter is adapted to handle very fine material, that is, such that the weight of the riffle is sufficient to hold it down to the proper gage, and in the event of the bed compacting more in one place or on one side than on another.

The head pocket of the pan is slightly different from the other pockets, as above described and shown in Figs. 2 and 4. The intention of the slight rise in the grade of the working surface, at the head of the pan is to float the water back from the head discharging mass, that it may be practically free from water, thus giving it greater impetus of discharge; and, too, the back wash makes it much cleaner, it being understood that solid matter has near double the cling-

ing power, or adhesiveness when not submerged.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:

1. A machine of the class described provided with a pan, and means for oscillating the pan and imparting percussive action to the same, the said pan being provided on its bottom with pockets having jig screens at the tops, and transversely-extending swinging riffles inclined forwardly and downwardly and fulcrumed at their rear elevated ends, the free forward ends of the swinging riffles resting on the said screens intermediate the ends thereof.

2. A machine of the class described provided with a pan, and means for oscillating the pan and imparting percussive action to the same, the said pan being provided on its bottom with pockets having jig screens at the tops, the forward end of each of the pockets being in the form of a barrier, and transversely-extending swinging riffles inclined forwardly and downwardly and fulcrumed at their rear elevated ends, the free forward ends of the swinging riffles resting on the said screens intermediate the ends thereof.

3. A machine of the class described provided with a pan, and means for oscillating the pan and imparting percussive action to the same, the said pan being provided on its bottom with pockets having jig screens at the tops, the bottoms of the pockets and their overlying screens being inclined forwardly and downwardly and the forward end of each pocket being in the form of a barrier, and transversely-extending swinging riffles inclined forwardly and downwardly and fulcrumed at their rear elevated ends, the free forward ends of the swinging riffles resting on the said screens intermediate the ends thereof.

4. A machine of the class described provided with a pan and means for oscillating the pan and imparting percussive action to the same, the said pan being provided on its bottom with pockets having jig screens at the tops, the bottom of the head pocket having an approximately horizontal bottom and the screen of this head pocket being inclined rearwardly and downwardly, and the bottoms of the remaining pockets and the overlying screens of these pockets being inclined forwardly and downwardly, the forward ends of the several pockets being in the form of transverse barriers having openings, and transversely-extending swinging riffles inclined forwardly and downwardly and fulcrumed at their rear elevated ends, the free forward ends of the swinging riffles resting on the said screens intermediate the ends thereof.

5. A machine of the class described pro-

vided with a pan and means for oscillating the pan and imparting percussive action to the same, the said pan being provided on its bottom with pockets having jig screens at the tops, transversely-extending swinging rifles inclined forwardly and downwardly and fulcrumed at their rear elevated ends, the free forward ends of the swinging rifles resting on the said screens intermediate the ends thereof, the rifles being supported by aid of side rods, said side rods having rear ends terminating in eyes, and pivots secured to the sides of the pan and engaged by the said eyes.

6. A machine of the class described provided with a pan and means for oscillating the pan and imparting percussive action to the same, the said pan being provided on its bottom with pockets having jig screens at the tops, the screens having meshes gradually increasing in size from the tail of the machine to the head thereof, and transversely-extending swinging rifles inclined forward and downwardly and fulcrumed at their rear elevated ends, the free forward ends of the swinging rifles resting on the said screens intermediate the ends thereof.

7. A machine of the class described provided with a pan and means for oscillating the pan and imparting a percussive action to the same, the pan being provided with swinging rifles inclined downwardly and forwardly toward the head of the pan, each rifle having a tension resistance against upward swinging of the rifle.

8. A machine of the class described pro-

vided with a pan and means for oscillating the pan and imparting percussive action to the same, the said pan being provided on its bottom with pockets having jig screens at the tops, the bottom of the head pocket having an approximately horizontal bottom and the screen of this head pocket being inclined rearwardly and downwardly, and the bottoms of the remaining pockets and the overlying screens of these pockets being inclined forwardly and downwardly, the forward ends of the several pockets being in the form of transverse barriers having openings.

9. A machine of the class described provided with a pan and means for oscillating the pan and imparting percussive action to the same, the said pan being provided on its bottom with pockets having jig screens at the tops, the bottom of the head pocket having a substantially horizontal bottom and the screen of this head pocket being inclined rearwardly and downwardly and the bottoms of the remaining pockets and the overlying screens of these pockets being inclined forwardly and downwardly, the barrier bounding one side of the head pocket extending above and below the adjacent end of the pocket being provided with a discharge opening at right angles to said barrier.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ALONZO C. CAMPBELL.

Witnesses:

VONNO L. GUDGER,
LUCILE CAMPBELL.