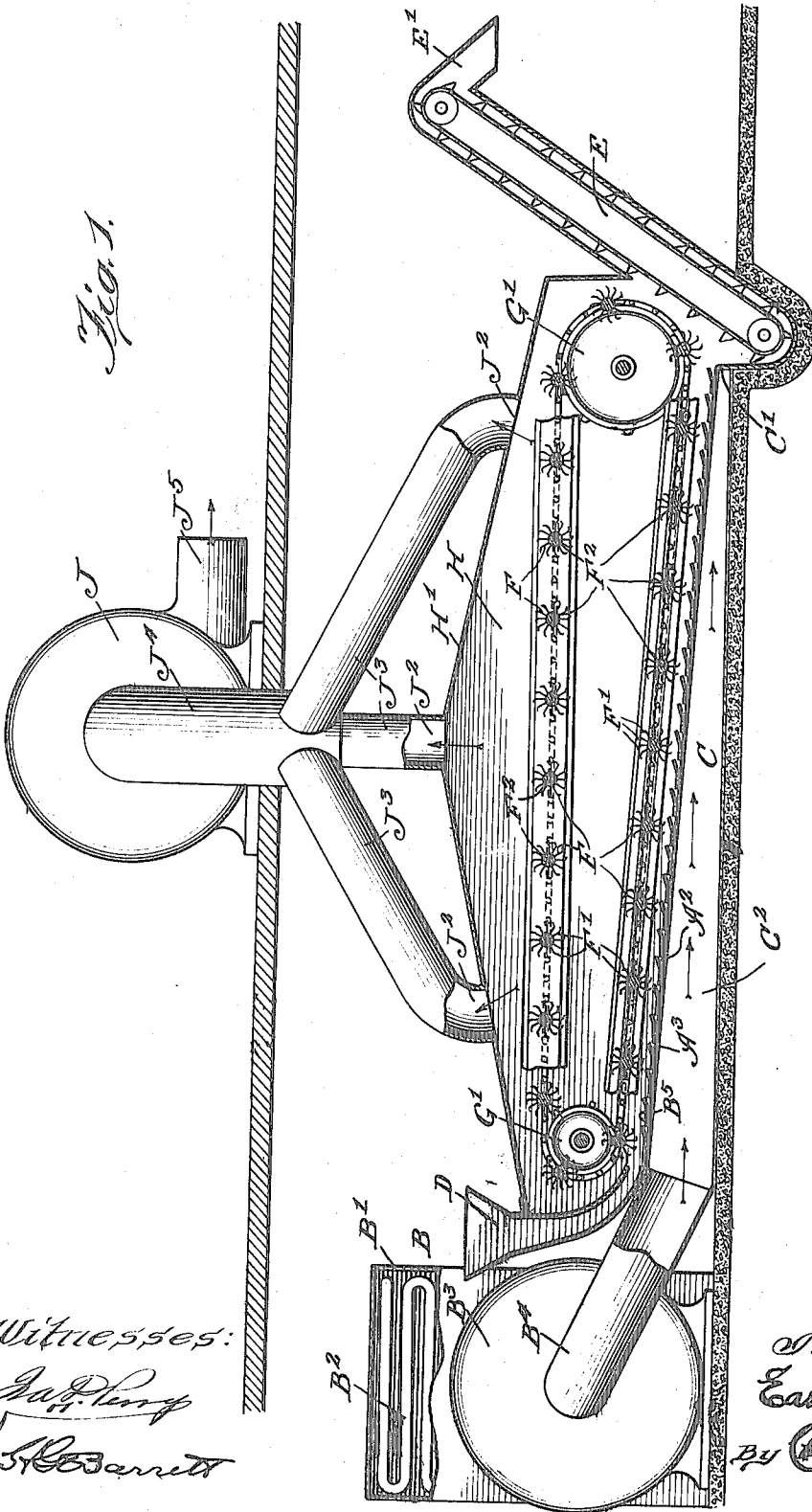


E. E. SILER.
 DRYING APPARATUS.
 APPLICATION FILED FEB. 15, 1915.

1,213,962.

Patented Jan. 30, 1917.
 3 SHEETS—SHEET 1.



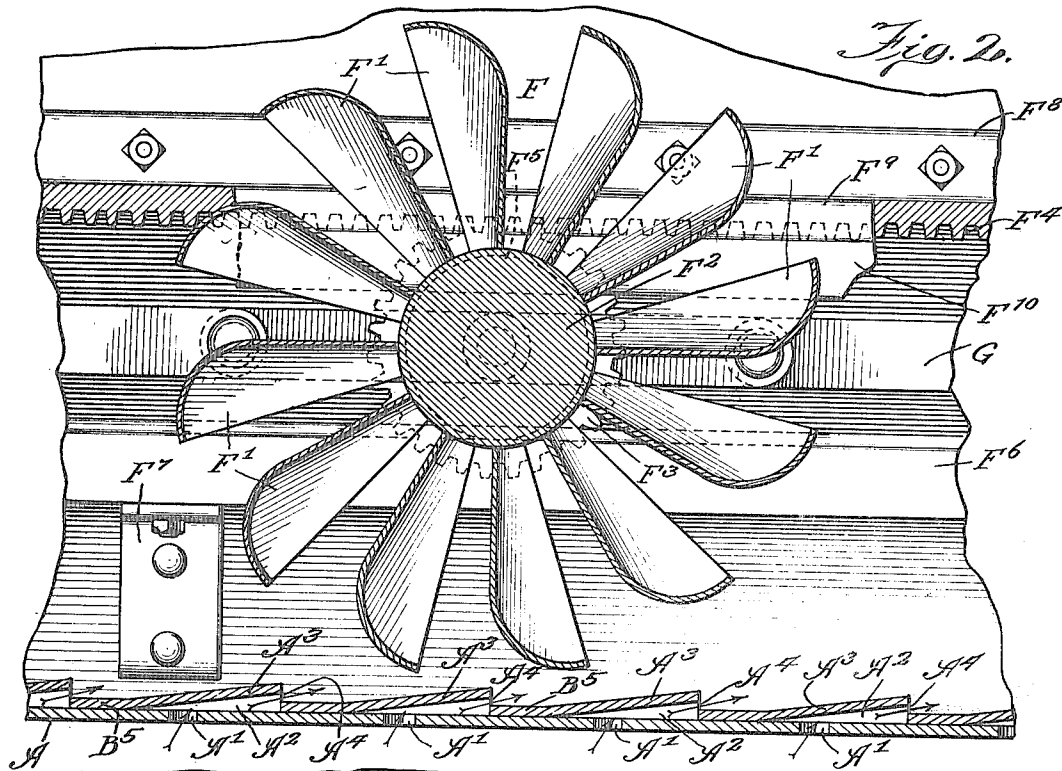
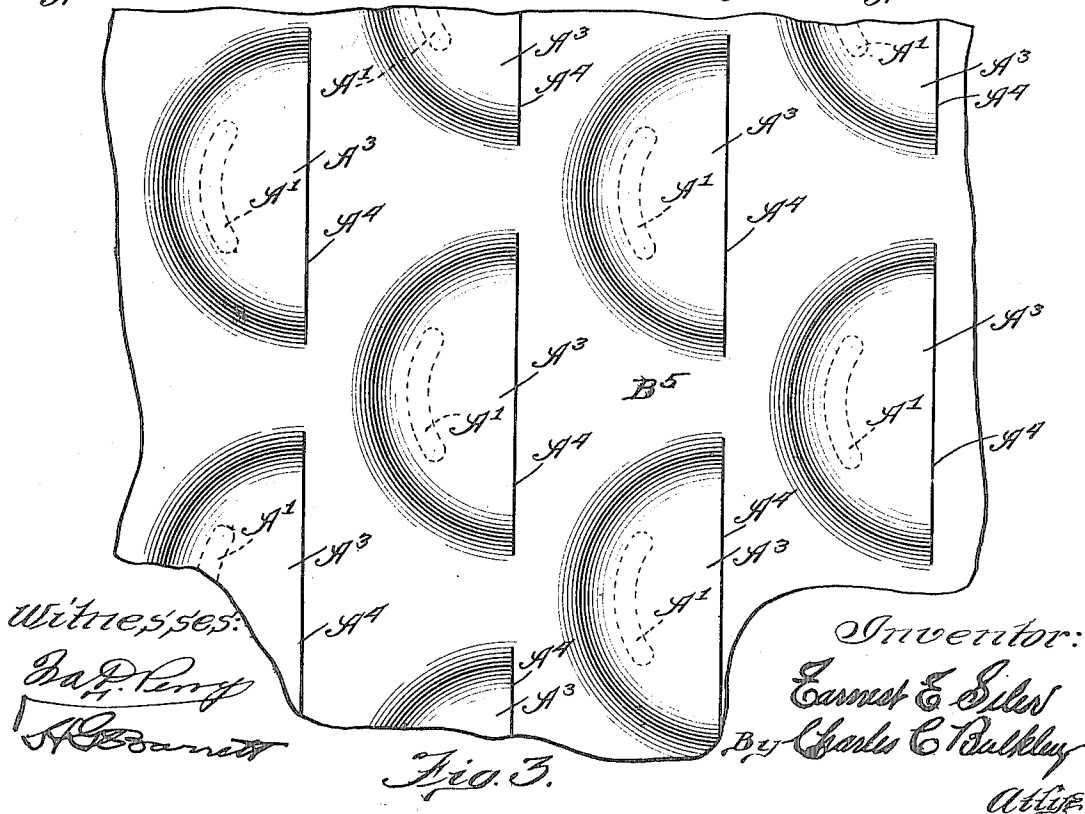
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Inventor:
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 By *Charles E. Bulley*
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3 SHEETS—SHEET 3.

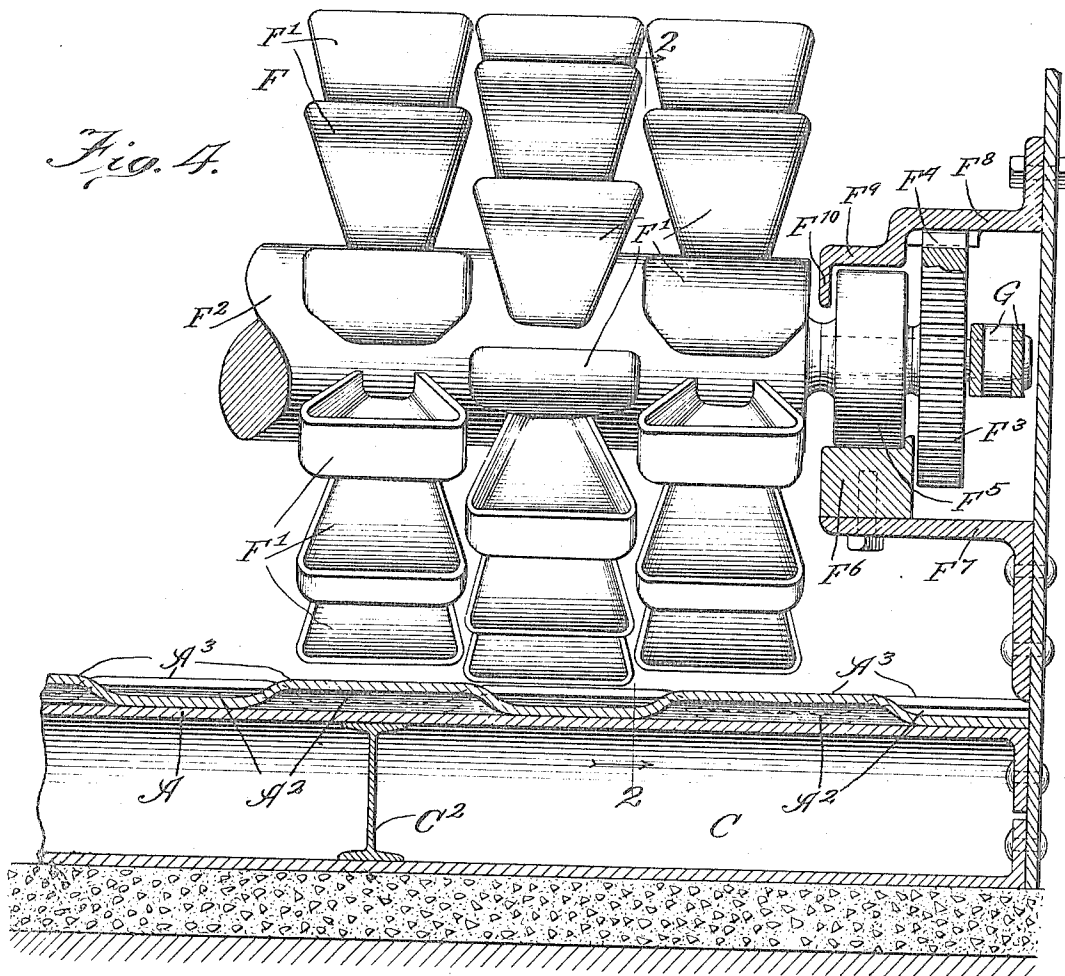
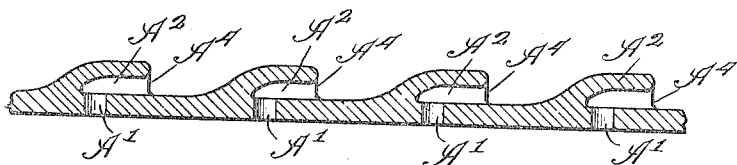


Fig. 5.

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 By Charles C. Buckley
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UNITED STATES PATENT OFFICE.

EARNEST E. SILER, OF CHICAGO, ILLINOIS, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, TO THE UNIVERSAL DRYING MACHINE COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

DRYING APPARATUS.

1,213,962.

Specification of Letters Patent.

Patented Jan. 30, 1917.

Application filed February 15, 1915. Serial No. 8,136.

To all whom it may concern:

Be it known that I, EARNEST E. SILER, a citizen of the United States of America, and resident of Chicago, Cook county, Illinois, have invented a certain new and useful Improvement in Drying Apparatus, of which the following is a specification.

My invention relates to improvements in apparatus for treating materials, and has more particular reference to apparatus of this character for drying or removing moisture from materials.

One of the objects of my invention is to provide an improved apparatus of this character which will be simple, durable and reliable in construction and effective and efficient in operation.

Other objects of my invention will appear hereinafter.

My invention consists in the features of novelty exemplified in the construction, combination and arrangement of parts hereinafter described, shown in the accompanying drawings, and more particularly set forth in the appended claims.

Referring now to the accompanying drawings, Figure 1 is a view principally in longitudinal section of a structure embodying my invention. Fig. 2 is an enlarged fragmentary sectional view showing the bed upon which the material is placed, and showing one of the agitators in its relation to said bed. Fig. 3 is an enlarged plan view of a portion of the drying bed. Fig. 4 is a view of the portion of the structure shown in Fig. 2 at right angles thereto, the bed and air chamber being in section and the agitators in full lines; and Fig. 5 is a sectional view enlarged of a portion of a modified drying bed construction.

It will be obvious to one skilled in the art, after having obtained an understanding of my invention from the disclosures herein made, that my invention is capable of modification without departing from the spirit and scope of the invention, and I wish it so understood.

The apparatus which I have shown in the drawings, and which embodies my invention, is designed more particularly for the purpose of drying or removing the moisture, or a portion thereof, from such materials as beet sugar pulp, brewers' grains, fertilizers and the like, so as to render the

products commercially marketable or usable. In this apparatus, I place the material to be treated upon a long bed, which may or may not be heated, as desired, and through which a drying fluid, such as heated dry air, is passed. This bed or support is provided with a plurality of openings or passages distributed over the face, or a portion of the face of the bed and arranged preferably, though not necessarily, in some definite or regular relation. I prefer to make this bed with its openings extending indirectly therethrough, and in this construction I use two plates of sheet metal, or other suitable material, for the purpose, these sheets A and B⁵ being superposed one above the other. The lower plate A of this bed is provided with a plurality of holes or openings A¹ of the proper size which communicate with an air chamber C on the underside of the bed and with a plurality of passages A². These passages A² may be formed in any desired manner, and in this construction I have shown them as being formed by offsetting or striking up portions A³ of the upper plate B⁵. In such manner that these struck-up portions form spaces between themselves and the upper surface of the plate A. Openings A⁴ are formed by severing a portion of the metal from the body thereof, and these openings communicate with the passages A² and permit the drying fluid to pass onto the upper surface of the bed and into and through the material supported on said bed. These struck-up portions may take any shape desired, and in the drawings I have shown them as being substantially half round and positioned so that the openings A⁴ all point in one direction. The reason for this lies in the fact that the material to be dried, in accordance with my invention, is adapted to be progressed or moved along the bed while being subjected to the action of the drying fluid, and by pointing or directing the openings all in the same direction, and in the direction along which the material moves, the material cannot work back into the openings and clog them. As a further precaution against the working back of the material and the clogging of the openings, the holes or openings A¹ of the plate A are offset with respect to the openings A⁴ so that the said openings A¹ register with the

rear portions of the struck-up portions A³. This arrangement provides indirect passages for the air from the air chamber underneath to the upper surface of the bed, and even though the material might work back into the openings A⁴ to some extent, it cannot work far enough back to drop through the openings A¹ into the air chamber below. Furthermore, the air or drying fluid passing through these passages in comparatively fine, definitely directed streams will act to keep the passages clear of material. It will be noted that the material, by reason of its being moved along the bed, will constantly tend to move away from, rather than toward, the openings A⁴.

In the construction shown in Fig. 5, the same effect is obtained, but the bed, instead of being built up of sheet metal properly perforated, is formed in one piece by casting or otherwise—that is to say, the struck-up portions A² are cast integral with the body of the plate. Beneath the bed is a long chamber C which is preferably common to the openings in the bed and by which the drying fluid is carried through the passages in the bed. This chamber is preferably closed at one end C¹, and at its other end communicates with a source of drying fluid. In the present structure, I have shown means for supplying heated air to the material. This means, which is shown at B, is representative of any suitable mechanism for this purpose and comprises a chamber B¹ which contains a plurality of heating coils B². The air in the chamber B¹ is introduced into the drying apparatus by means of a suitable blower mechanism B³, which communicates at its intake side with the chamber B¹ and at its discharge side with the end of the air chamber C by means of a suitable duct B⁴. This blower is adapted to supply the heated air to the drying apparatus at the pressure found to be proper under the particular circumstances and requirements. For the sake of properly supporting the drying bed on account of its comparatively great length, it may be arranged to rest upon beams C², or other suitable supporting members, which in this case are disposed longitudinally of the chamber C so as not to interfere with the passage of the air there-through to the farthest end thereof. The material to be dried may be introduced into the apparatus, or placed upon the bed in any desired manner, but I prefer to introduce it at a uniform rate at one end of the bed and discharge it at the other end thereof so that it will be subjected to the drying treatment for a considerable period of time while progressing from one end of the bed to the other. For this reason I have shown a hopper D at the intake end as representative of any desired means for introducing the material properly to the apparatus; and at the

other end, or discharge end of the apparatus, the material may be arranged to leave the bed and drop or be fed on to a suitable chain conveyer E which may be inclined upwardly and arranged with its discharge chute E¹ in position to discharge the dried material directly into a car or other conveyance.

As a means of insuring the progress of the material along the bed, the bed may be inclined downwardly to the desired degree from its intake end to its discharge end, as clearly shown in Fig. 1. I prefer to agitate or tumble the material about on the bed as it progresses therealong, so that it will be thoroughly and completely subjected in all its particles to the drying action of the air emanating from the openings or perforations in the bed, and for this reason I provide a plurality of agitators F operating to engage and tumble the material about. These agitators are preferably carried at intervals by a continuous chain or belt G traveling along sprockets, or other suitable supports D¹ at the ends of the bed, and having its lower reach disposed substantially parallel with the plane of the drying bed. This chain may be driven by any suitable mechanism, which need not be described, and in this construction its lower reach is arranged to travel from the intake end of the apparatus toward the discharge end thereof—that is, in the direction in which the material moves. In consequence, the agitators on the lower reach travel in that direction and their effect is to progress the material along the bed. These agitators in the present structure are rotary in character, and are preferably made up of a plurality of vanes or blades F¹, which are mounted on hubs or shafts F² disposed transversely of the drying bed, and rotation is imparted to them by means of gears F³ carried at the ends of the shafts or hubs F² and adapted to mesh with and travel along a continuous toothed rack F⁴ disposed along the upper side of said gears. For the purpose of guiding the agitators along a definite line with respect particularly to the drying bed, the shafts or hubs F² of the agitators are provided with free running rollers F⁵ at their ends which travel along suitable lower guides F⁶ supported on suitable members F⁷ outstanding from the wall of the casing or housing which incloses the bed and the agitator mechanism. The members F⁸ which support the toothed racks F⁴ are formed at F⁹ so as to provide upper guides for the rollers F⁵.

The supports F⁷ and F⁸, together with the guide members, form housings around the chain and gears which prevent the material from reaching said driving members, and if desired the upper supports F⁸ may have overhanging flanges F¹⁰, as a further assurance. This driving mechanism for the agi-

tator operates to rotate said agitator in the direction in which said agitators and the material travel bodily,—that is to say, the blades or vanes nearest the bed move or rotate in the same direction that the material travels and operates to progress the material along the bed, and at the same time properly agitates or tumbles the material about on the bed. In this structure, the vanes or blades are preferably radially disposed about their hubs F^2 in circumferential series or rows and the vanes of each row are staggered with respect to those of the adjacent rows so as to further carry out the agitating effect which they would have upon the material. These blades or vanes may be of any suitable shape for the purpose. For instance, some materials may be of such character that it will not only be desirable to simply move the material along the bed and agitate it on the bed, but it will also be desirable to actually raise or lift the material off of the bed and sift or drop it back onto the bed so that the air will intimately reach all parts of said material. Under such conditions I prefer to make the vanes somewhat scoop-shaped, as shown in the drawings, so that they will actually scoop up the material, carry it over themselves and drop it back onto the bed, but under conditions where the material is of such character that it cannot be readily scooped up or raised in this manner, the vanes may be formed in such manner that they will push or roll the material, so to speak, along the bed and agitate it at the same time. The shape, number and speed of rotation of these vanes, of course, depends upon the particular conditions under which the apparatus is operating and upon the character and condition of the material. The bed and agitator mechanism are all inclosed within a chamber H formed by a suitable housing H^1 , and the moisture laden air or fluid resulting from the action of the heat of drying the material is preferably carried or drawn from this chamber as fast as necessary under the particular conditions. In this structure, I have shown an exhaust mechanism J connected

with the chamber H at a plurality of distributed points J^2 by the ducts J^3 which converge into a common duct J^4 entering the exhaust mechanism J. The exhaust mechanism may discharge the moisture laden air into the atmosphere through its discharge outlet J^5 .

What I claim as my invention is:

1. The combination of means forming a supporting surface for the material to be treated, and having a plurality of indirect air passages through which air is emitted to dry the material, and rotary agitators operating to tumble the material about to subject all of its particles to the action of the air.

2. The combination of means forming a supporting surface for the material to be treated, and having a plurality of indirect air passages through which air is emitted, to dry the material, rotary agitators operating to tumble the material about to subject all of its particles to the action of the air, and means for carrying off the moisture laden air.

3. A bed of the class described comprising a plurality of superposed members forming a support for the material to be treated, the lower of said members having a plurality of perforations, and the upper of said members having a plurality of openings communicating with said perforations but offset with respect thereto.

4. The combination of a drying bed comprising a flat supporting member having a plurality of air passages and low guards disposed over said passages and forming mouths for said passages disposed at an angle to the plane of said plate and facing all in the same direction, and means for moving the material along the bed in the direction in which said mouths face.

Signed by me at Chicago, Illinois, this 13 day of February, 1915.

EARNEST E. SILER.

Witnesses:

H. S. BEAUBIEN,
E. H. CLEGG.