

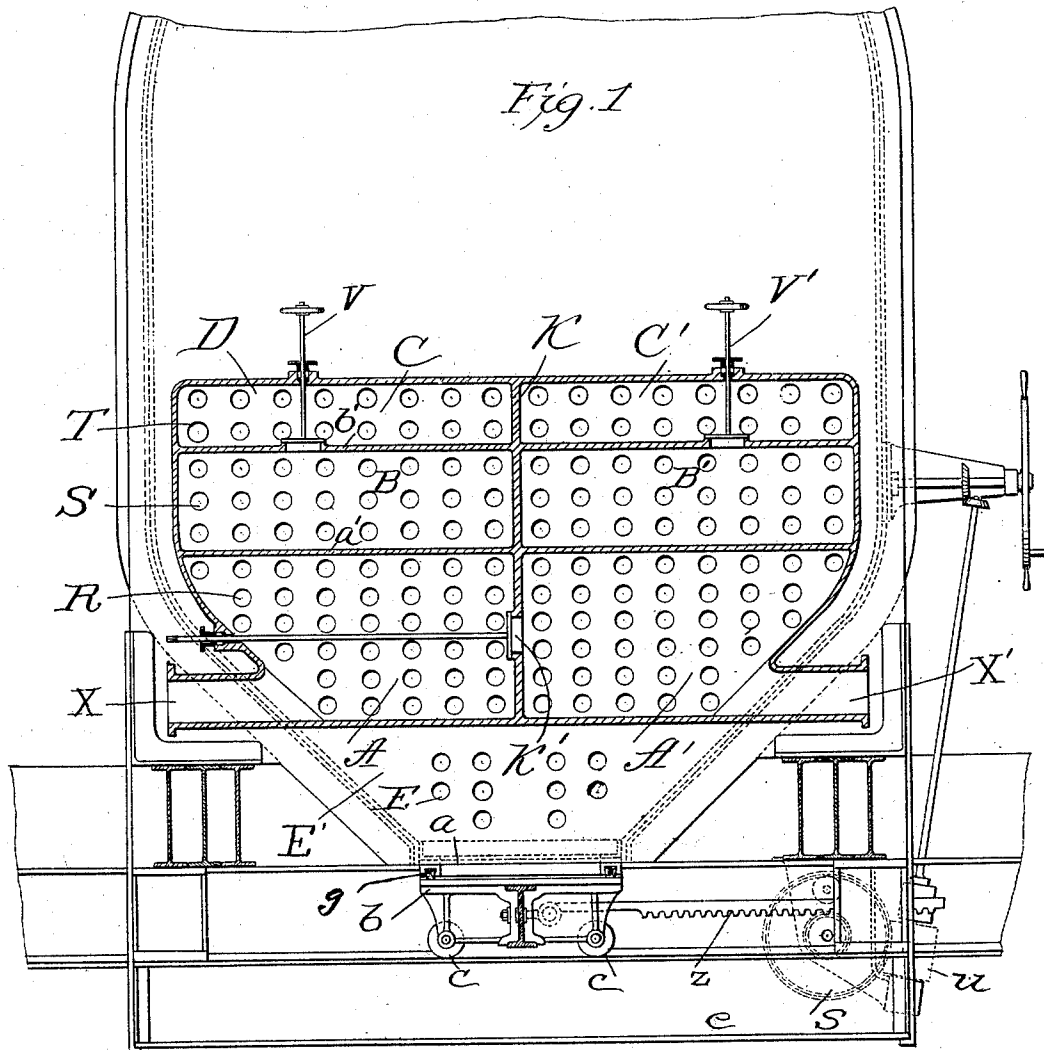
(No Model.)

4 Sheets—Sheet 1.

J. LEXA & J. HEROLD.
EVAPORATING PAN.

No. 509,918.

Patented Dec. 5, 1893.



Witnesses
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M. L. Lippitt

Inventors:
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Jan Herold
by *[Signature]* Attorney

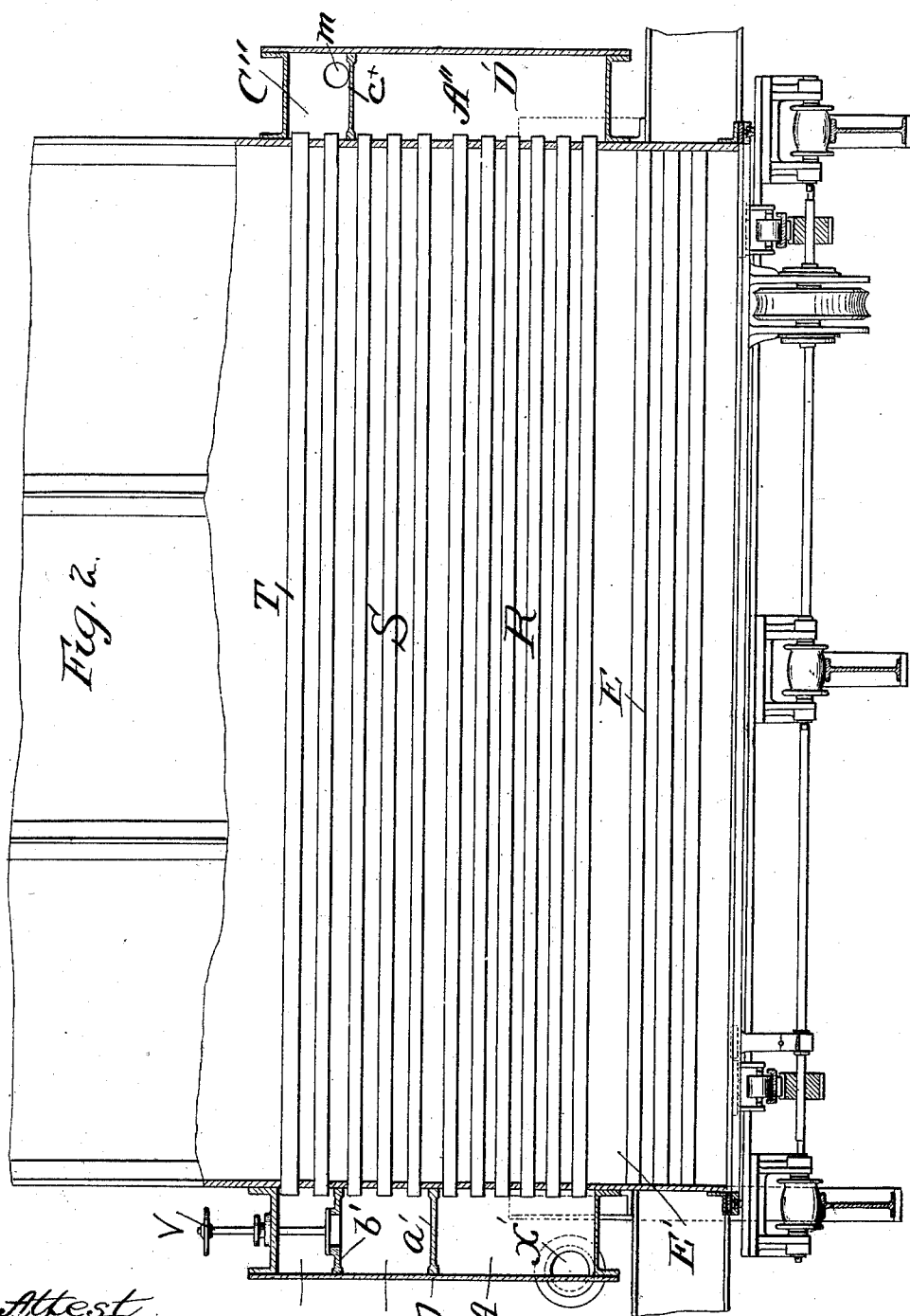
(No Model.)

4 Sheets—Sheet 2.

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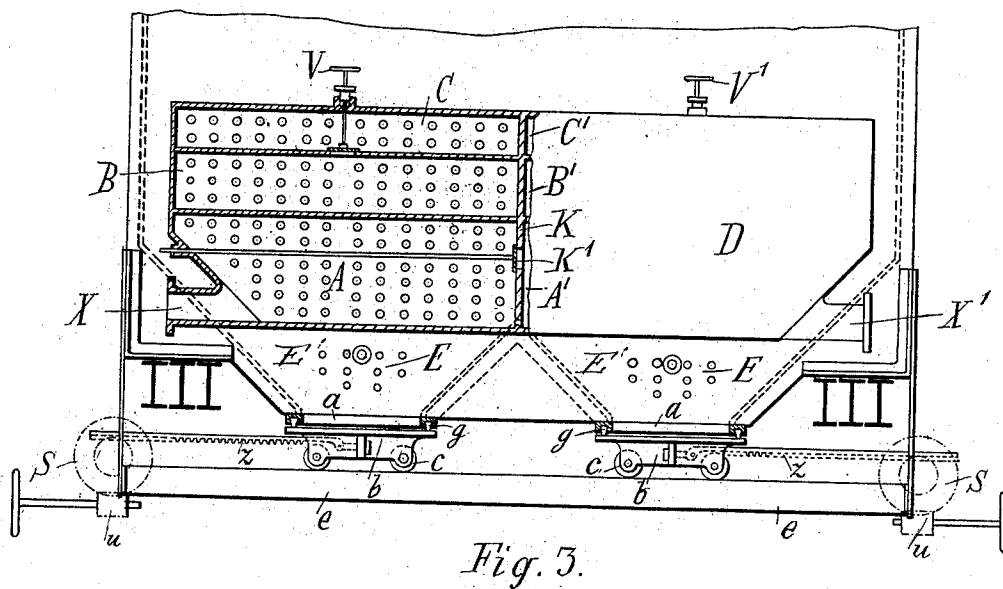


Fig. 5.

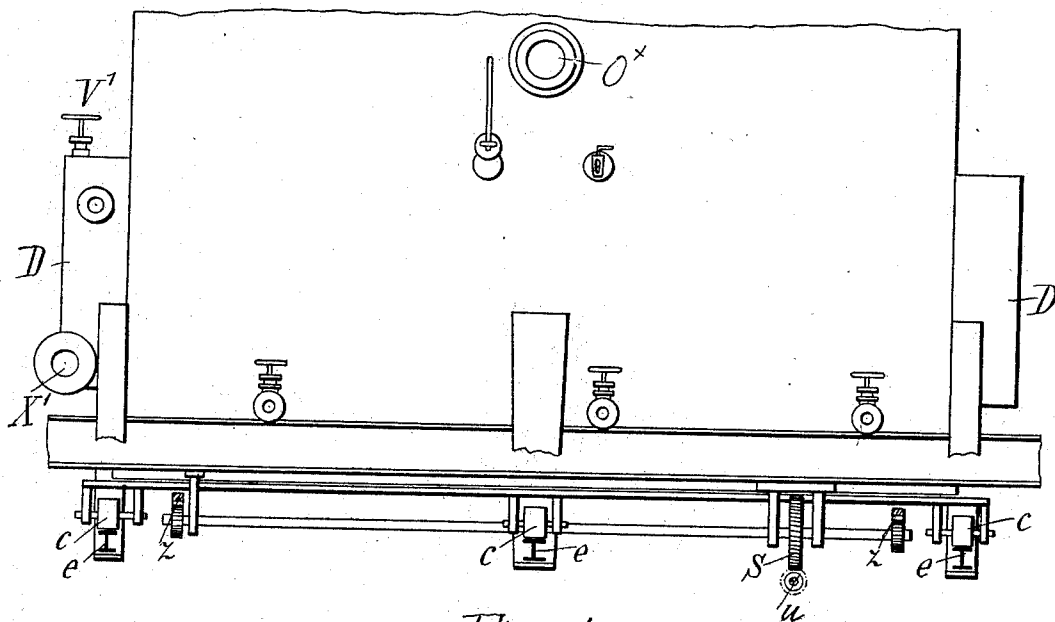


Fig. 4.

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Fig. 5.

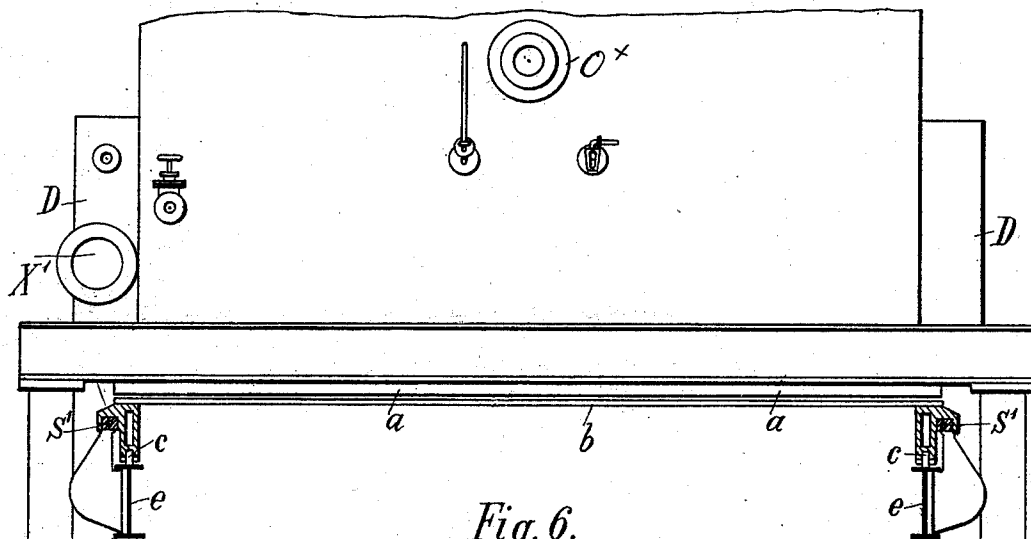
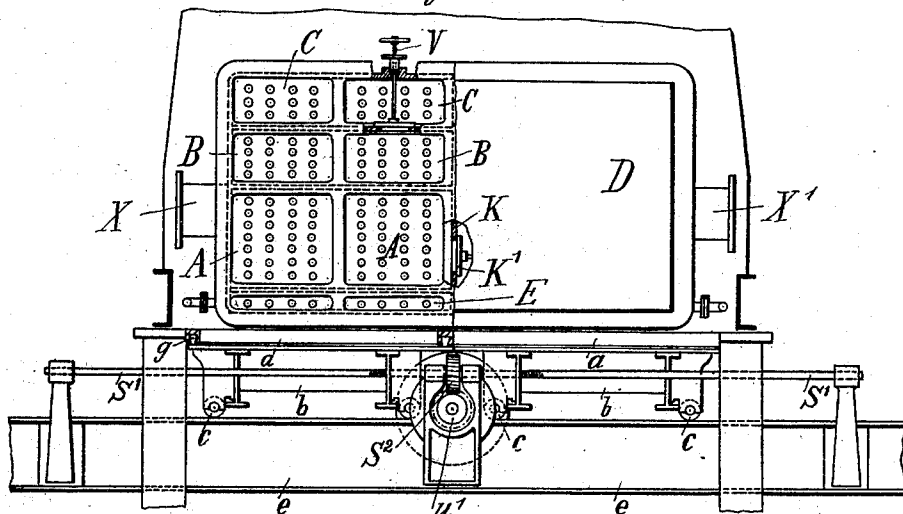


Fig. 6.

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UNITED STATES PATENT OFFICE.

JOSEF LEXA AND JAN HEROLD, OF PRAGUE, AUSTRIA-HUNGARY.

EVAPORATING-PAN.

SPECIFICATION forming part of Letters Patent No. 509,918, dated December 5, 1893.

Application filed July 27, 1892. Serial No. 441,374. (No model.) Patented in Austria-Hungary July 7, 1886, No. 10,554 and No. 32,979; in Russia April 10, 1890, No. 3,484; in France October 2, 1891, No. 216,492, and in Belgium December 13, 1891, No. 97,914.

To all whom it may concern:

Be it known that we, JOSEF LEXA and JAN HEROLD, subjects of the Emperor of Austria-Hungary, residing at Prague, Bohemia, Austria-Hungary, have invented certain new and useful Improvements in Sugar-Boilers, of which the following is a full, clear, and exact specification.

The invention has been patented to us in France October 2, 1891, No. 216,492; in Belgium December 13, 1891, No. 97,914; in Russia April 10, 1890, No. 3,484, and in Austria-Hungary July 7, 1886, No. 10,554 and No. 32,979.

It is the object of our invention to provide an apparatus for boiling or concentrating juices and especially for the finishing of sugar loaves.

Our apparatus comprises a series of compartments having steam coils and suitable valves for controlling the supply of steam. The coils in the several compartments are intended to receive steam of different degrees of temperature for acting upon the material at different stages in its treatment with different intensities.

The apparatus comprises also, sliding doors at the lower open end in order to remove from the lower part of the boiler the thick material which results at the completion of the operation.

The apparatus comprises also hollow packing rings adapted to be filled with water under pressure to make a tight joint between the said sliding door and the bottom of the lower boiler compartment.

In the drawings Figure 1—is a side view of the apparatus partly in section. Fig. 2—is a longitudinal section of the same. Fig. 3—is a view similar to Fig. 1, this apparatus however, being double. Fig. 4—is a rear view of the apparatus shown in Fig. 3. Figs. 5—and 6—are views similar to Figs. 3 and 4 of a modified form of apparatus.

The front steam chamber D of our vacuum boiler comprises compartments A A', B B', C C' divided from each other by horizontal partitions a' b'. The compartments are arranged in two series divided vertically by a partition wall K. The rear steam chamber comprises the lower compartment A'' and the

upper compartment C'' divided therefrom by the partition c'. From this compartment C'' the final outlet for the steam m leads to any suitable point. This rear chamber is also divided into two series of compartments by a vertical wall similar to K before described. A series of pipes R lead from the lower front compartments A, A' to the lower part of the rear compartment A''. The upper part of this compartment as shown in Fig. 2 connects with the front compartment B or B' by a second series of pipes S which open therein above the partition plate a'. From these compartments B, B' communication is had with the upper compartment C, C' respectively through openings in the partition b' which openings are controlled by the valves V, V' and from these upper compartments the steam passes through a third series of pipes T, to the rear compartments C'' from which the exhaust steam port leads. The two vertical series of superimposed compartments A, B, C, and A', B', C', have separate inlets X, X', for the inlet of steam but both sets of compartments may be thrown into communication with each other by opening the valve K', Fig. 1, controlling an opening in that portion of the vertical wall K which extends between the compartments A, A'. By having the two series of superimposed compartments arranged side by side and divided from each other, steam from a different source may be supplied to the said compartments through the inlets X, X', the communication between the compartments of the two series being controlled by the valve K'. Below the said compartments comprising the horizontal heating systems A A' B B' C C', there is another compartment E' having tubes or heating pipes E, these being entirely independent of the other compartments and pipes first mentioned, so that they can be heated by steam from a different source, either by direct or discharge steam.

In operating our apparatus the cheapest available steam is first employed, being of from 203° to 216° Fahrenheit and as the mixture becomes more dense and contains less water or moisture steam of a higher temperature is used and when the material becomes

very thick and the process is finished by taking the steam direct from the discharge of the steam engine.

By reason of the use of the two series of compartments it will be clear that either one or the other of them may be heated with any desired grade of steam independently though they may be put in communication with each other through the valve K'.

The valves V, V', are used to control the flow of steam as it is wanted in the several compartments that is to say the operation begins by supplying steam to the lower compartment and pipes when the mass is in the bottom of the boiler, the boiling thus taking place in the lowest compartments, and as the juice rises in the boiler the horizontal valves V, V' are opened and the steam let in from the lower compartment just where the boiling is to take place.

If it is desirous to work the whole boiler with one and the same steam, the vertical valve K' will be opened, and the steam admitted through only one of the inlets, X or X'. The steam, whether it is all of the same kind, or not is in every case led to the lowest range of heating tubes R by the front chamber, and it passes to the rear chamber through the lowest range of these tubes R. Here it turns and returns through the second range of heating tubes S to the front chamber at B, B'. If the valves V and V' are open, the heating steam traverses the partition b', and flows through the highest range of horizontal heating tubes T to the outlet m.

In order to operate the boiling and thickening of juice, we prefer to let in a sufficient quantity of the juice, to cover the tubes. The juice is let in through opening O'. After this the heating steam is admitted through the inlets X, X', or through one of them as the case may be. In case of crystallization, a certain time is needed, and as soon as the juice thickens, fresh juice must be added, so as to cover the tubes T again. The valves V and V' are then opened, and the steam rises from the second range of the heating tubes to the third one, and traversing these tubes T leaves the apparatus by the outlet m. Now when the liquid in the highest range of tubes, in T, is also thickened the boiling is finished.

In the process of boiling sugar crystallization is required. In this case addition of smaller quantities of juice at intervals is useful, during the continual evaporation. In this way ninety-seven per cent of the water contained in the primary sugar solution can be removed leaving only the original moisture in the sugar when it is ready to be dropped into the reservoir from the evaporating pan.

A complete and rapid discharge of the boiled mass may be effected by means of the horizontal door b. This can be constructed in one or in several pieces. It can be slid upon horizontal rails e by means of rollers c. It is kept tight by means of a hollow india rubber packing ring g which is filled with water un-

der high pressure, when the door is shut, and the water is discharged again, before the door is to be opened. The discharge opening and the sash door are of the same length as the whole apparatus, and in the form shown in Figs. 5 and 6, Sheet 4, it is also of the same width as the vacuum boiler, while in Figs. 1 and 3 the openings are at the lower ends of the sloping walls forming the compartment E'. We put the hollow india rubber ring usually into the rim of the bottom of the vacuum boiler, so that it presses against the rim of the doors. As soon as it is filled with compressed water, a tight joint is formed between the door and the walls about the opening.

The sliding of the door is usually accomplished by means of a horizontal rack z, and its pinion, with a worm wheel upon the same shaft, this being actuated by a worm u, Figs. 1 to 4; or the door may be formed in sections which are slid in opposite directions at once by means of right and left hand threaded screws S', which are turned by the worm u' and wheel S², by appropriate gearing, Figs. 5 and 6.

The operation is briefly as follows:—The juice having been let in to fill the space about the tubes and to reach above them the steam is let in through inlets X, X', and passes through the pipes R and rear chamber into the pipes S thus heating the juice. After this heating has continued for a while and the lower part of the juice has thickened the valves V, V' are opened and the steam rises from the second range of tubes to the third range T and passing through these it passes from the apparatus through the outlet m. The juice about the tubes T thus becomes thick and the boiling is thus completed after which the sugar may be discharged through the door b.

We claim—

1. In an evaporating apparatus and in combination, the boiler, the steam chambers D, D' at the front and rear thereof divided into compartments by horizontal partitions, the series of pipes extending through the boiler and opening into the compartments of the steam chambers, and the valve in one of the horizontal partitions to control the flow of steam from one compartment to the next above it, substantially as described.

2. In an evaporating apparatus and in combination, the boiler, the series of pipes R, S, T, extending through the same and communicating with each other at the front and rear and the valve between the last two series of pipes, substantially as described.

3. In an evaporating apparatus and in combination, the boiler, the steam chambers at the front and rear thereof divided by a vertical partition K, and into two sets of superimposed compartments, A, B, C, and A', B', C', by horizontal partitions, the valve V in one of the horizontal partitions of the set of compartments A, B, C the valve V' in one of

the partitions of the set of compartments A', B', C', the independent inlets for the two vertical sets of compartments, the valve K' in the partition K and the series of pipes R, S, T, extending through the boiler from one steam chamber to the other, substantially as described.

4. In an evaporating apparatus and in combination, the boiler having the series of tubes R, S, T, the steam chambers at front and rear into which the tubes open, the inlets leading to the steam chambers, the compartment E' and discharge door arranged in the lower

part of the boiler, and the independent series of steam tubes E arranged in the chamber E' below the series R and adapted for connection with its supply independent of the steam chambers, substantially as described.

In witness whereof we have hereunto set our hands in presence of two witnesses.

JOSEF LEXA.
JAN HEROLD.

Witnesses:

L. VOJAIK,
ADOLPH FISCHER.