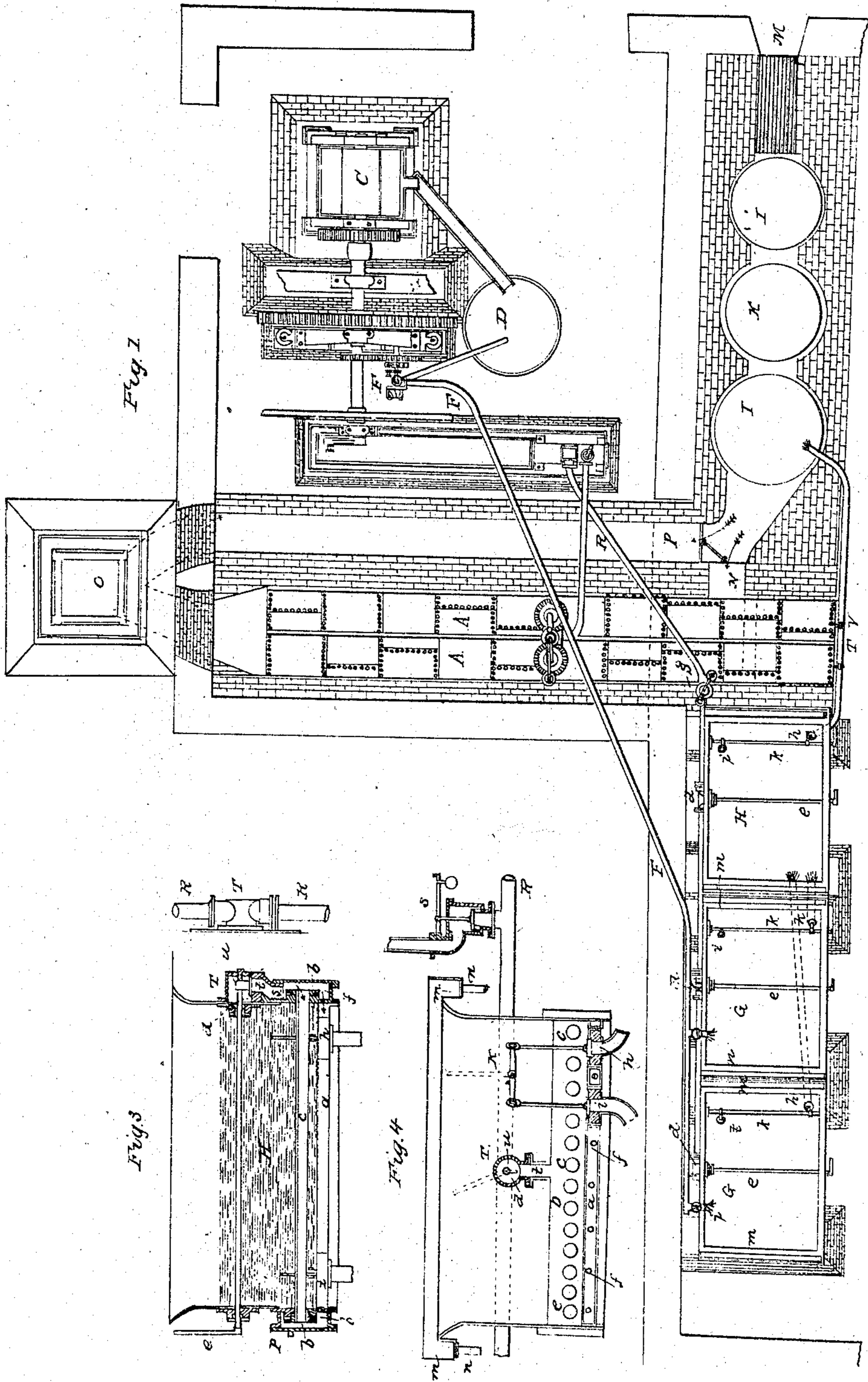


A. STILLMAN.
Evaporating Pan.

2 Sheets—Sheet 1.

No. 3,223.

Patented Aug. 17, 1843.

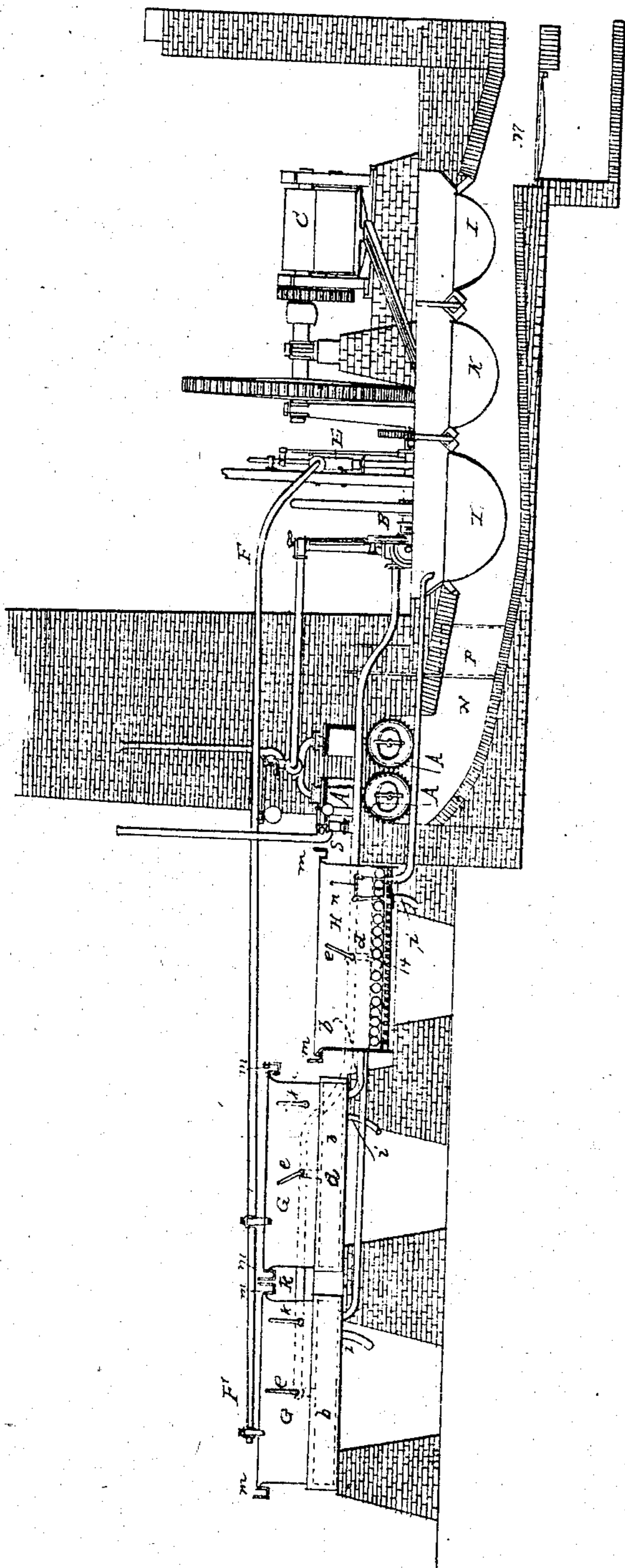


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UNITED STATES PATENT OFFICE.

ALFRED STILLMAN, OF NEW YORK, N. Y.

IMPROVEMENT IN EVAPORATING SACCHARINE JUICES.

Specification forming part of Letters Patent No. 3,223, dated August 17, 1843.

To all whom it may concern:

Be it known that I, ALFRED STILLMAN, of the city and State of New York, have invented a new and useful Improvement in Evaporating Saccharine Juices; and I do hereby declare that the following is a full and exact description of the same as applied to evaporating the juice of the sugar-cane, although the same shall apply equally to evaporating any other of the saccharine juices.

The nature of my invention consists in placing between the usual "train" of "coppers" or "kettles" and the chimney, steam-boilers which shall employ the surplus or waste heat from the train in generating steam for grinding cane, pumping, or any other purpose for which it may be required. This others have done, but not with good results, for the reason that the train of copper, being undiminished in length, absorbed so much of the heat of the fire as to render it of but little use to the steam-boilers. I obviate this difficulty by diminishing to any extent the number of kettles in the train, and bring the steam-boilers into closer contact with the fire. To supply the deficiency of evaporating-power occasioned by diminishing the train of kettles, I substitute in their place any number of steam evaporators or clarifiers into which is introduced the "exhaust" or waste steam from the steam-engine. This waste steam, to be made effective, must be introduced into the clarifiers or evaporators under a pressure greater than that of the atmosphere, and the effect will be in proportion to the pressure. The objects which I secure are a saving of fuel and improvement in the quality of the product, and the improvement in the latter respect will be proportionate to that amount of the process for clarifying and evaporating which is transferred from the ordinary kettles in contact with the fire to those making use of the waste steam.

To enable others skilled in the art to make and use my invention, I proceed to describe its construction and operation, reference being had to the annexed drawings, making part of this specification.

Figures 1 and 2 are a plan and elevation of a sugar-works in which are shown the application of my improvement, and representing only a general arrangement.

The letters of reference apply to the same parts in the two figures.

A A are the steam-boilers, so placed as to receive under them the waste from the train. B is the steam-engine. C is the "cane-mill." D is the reservoir for cane-juice from the mill. E is the pump for lifting the liquor from the reservoir to the clarifiers through the pipe F. This pump is not an essential fixture, as the mill is more frequently elevated to a height sufficient for the liquor to run directly to the clarifiers. G G are the clarifiers. H is the evaporator, which is of the same form and construction as the clarifiers. I K L represent a train of coppers or evaporators such as are in common use. M is the fire-place for the train. N is the flue through which the flame passes from the train under the steam-boilers to the chimney. O. P is also a flue to the chimney, so that the flame from the train may be turned off from the steam-boilers at will. R is the exhaust-steam pipe from the engine. This pipe communicates with the pipes in the clarifiers or evaporators. S is the escape-valve, by which a pressure is maintained in the exhaust-pipe.

Figs. 3 and 4 are elevations in section of the clarifiers, showing their construction, which is as follows: I construct a rectangular box of sheet-iron, (boiler-plate,) the bottom of which I make double, so as to form the steam-chamber *u*. Around the top I construct a channel-way, *m*, which forms the "skimming-spout." The skimmings which it receives are carried off by the pipe.

In addition to the heating-surface obtained by the double bottom, I place above it one or more tiers of copper pipes. The method of introducing them is as follows: On two opposite sides of the clarifiers I rivet a cast-iron box, which form the side chamber, *b b*, and extends the whole length of the clarifier. This chamber is closed by the movable plate *p*, which is fastened by bolts, as shown at *r*. These two opposite chambers are connected by the cross-pipes *c*. The pipes are received into the chambers through the packing-joints *s s*, so as to prevent any communication between the steam in the chamber and the liquor within the clarifier. To the top of one of the side chambers I attach a cylindrical valve-chamber, T, which receives the steam from the exhaust-pipe on either side. From the lower side of this valve-chamber is a steam-passage, *t*, communicating with the chamber *b*. This steam-passage is

opened or closed by means of a sliding valve, *d*, which is moved by the arm *u*, attached to the shaft *e*, which shaft extends through the clarifier to the opposite side. This particular method of admitting into and shutting off the steam from the clarifiers is not essential, as any of the methods in common use for similar purposes will answer. A steam communication from the side chamber, *b*, to the space *a* (formed by the double bottom of the clarifier) is provided by the apertures *f f*. When the engine is in operation, the waste steam passing through the exhaust-pipe *R* is admitted through the aperture *t* into the side chamber, *b*, and from thence into the pipes *c c*, and also through the apertures *f f* into the bottom chamber *a*. The liquor in the clarifier is then exposed to the heating-surfaces of the pipes *c c*, and also of the "false" or "double" bottom.

Steam-pipes passing through the liquor have been before employed, but not in combination with the double bottom. The advantage of this combination is this: By using the pipes alone, that portion of the liquor beneath them would be in a great measure unaffected, while the double bottom alone would not give the necessary heating-surface, so that the combination is necessary to a perfect operation. The pipes are not necessarily introduced in this particular shape or manner, as I have used with good success (in place of the separate pipes here described) an ordinary coil of pipe or worm placed near the bottom of the clarifier, and connected through the side (by flanges) to the exhaust-pipe, the steam being admitted and shut off by a cock.

For convenience of access and repair, I prefer the construction before described.

h and *i* are two valves—one for discharging the clarified or concentrated liquor, and the other for discharging the sediment formed in clarifying. Their construction is as follows: The valve is the ordinary "puppet-valve," with a hinge on the upper side for attaching the rods. The seat is fitted between the two bottoms of the clarifier and riveted to both. The pipes for carrying off the liquor and sediment are attached by flanges and bolts to the bottom of the seats. The valves will close by their own weight, and the weight of the liquor above them will keep them tight. The valves are raised by rods connecting them to levers on the shaft *K*, which shaft is worked by a handle on the outside of the clarifier. The valves are so placed that the levers stand in opposite directions upon the same shaft, so that both valves can never be opened at the same time.

The kind of valves here employed, or the method of working them, are not essential features of my invention. The only object to be secured is to discharge the liquor and sediment from the lowest points by any means practicable.

S is the escape-valve, made like an ordinary safety-valve, (such as used on all steam-boilers,) and attached to the exhaust-pipe of

the engine. Its particular construction, however, is not essential, its purpose being to obtain all the useful effect of the waste steam by confining it in the exhaust-pipe and clarifiers at any required pressure. Suppose, for instance, that the engine is in operation, and the exhaust-pipe terminating in the clarifiers, but in some part of the exhaust-pipe there is an opening into the air of a size equal to that of the pipe. The steam of course would escape through the opening against the pressure of the atmosphere, only its effect in the clarifiers would then be very slight; but if we close that opening by means of a loaded valve (like an ordinary safety-valve,) we obtain some effect from the steam, and by increasing the weight on the valve we may so confine the waste steam as to effect the entire absorption of its heat in the clarifiers or evaporators, and without materially affecting the power of the engine.

The operation of a sugar-works having my improvements is as follows: The flues *N* and *P* being closed by dampers, (at the beginning of a day's work,) a fire is made under the steam-boilers at *U*, Fig. 1, in the usual manner. As soon as a sufficiency of steam is generated, the engine and cane-mill are put in operation, and the reservoir *D* filled with the cane-liquor. The pump *E* is then put in operation, and the liquor carried to the clarifiers *G G* through the pipe *F*. The steam is then admitted from the exhaust-pipe into the clarifiers, and the liquor, having gone through the usual process of clarifying, is discharged by means of the valves *h h* into the evaporator *H*, and through that into the train of coppers *I K L*, where the evaporation is to be completed. These coppers or kettles being filled with the clarified liquor, the furnace at *U*, Fig. 1, is closed, and the fire started under the train of coppers in the furnace *M*, by which fire (beside effecting the concentration of the liquor in the kettles) the steam is generated in the boilers, and the operation continued.

I will here add that the steam-clarifiers herein described may be used indiscriminately in clarifying or evaporating, as the case may require. If the train of coppers be very much diminished, more of the evaporation, of course, must be carried on in the steam-evaporators.

I do not claim the reapplication of the fire from the train of kettles or coppers to the purpose of generating steam; nor the application of exhaust-steam to clarifying or evaporating; nor any particular construction of a valve by which to maintain a pressure in the exhaust-pipe and clarifiers; nor any particular arrangement of the steam-boilers and flues, or of the steam-engine and cane-mill; but

What I do claim; and desire to secure by Letters Patent, is—

1. The substituting any number of steam evaporators or clarifiers constructed and operating as herein set forth for any number of the ordinary train of coppers or kettles, to the effect that the steam-boilers may be brought

nearer to the strength of the fire from the train.

2. The arrangement of the pipes passing through the liquid, in combination with the double bottoms, as set forth.

3. The method herein set forth of applying the exhaust-steam from the engine—that is to say, by closing the exhaust-pipe by means of

a loaded valve, so as to maintain within it a pressure greater than that of the atmosphere—all of which is above substantially described.

New York, July 31, 1843.

ALFRED STILLMAN.

Witnesses:

F. M. STILLMAN,

CHAS. C. GREENOUGH.