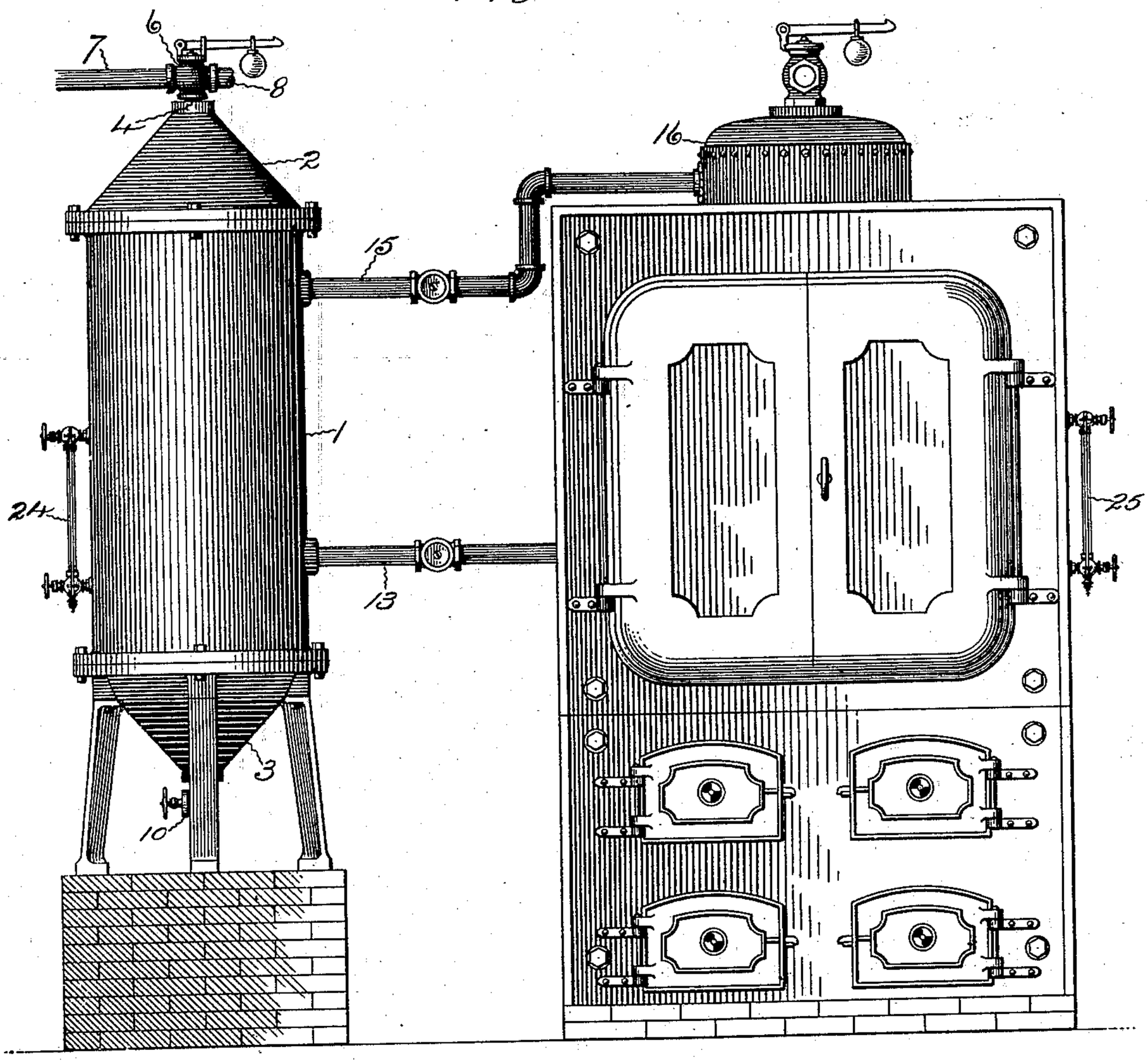
(No Model.) 2 Sheets—Sheet 1.

W. L. SHEPARD.

FEED WATER PURIFIER.

No. 578,903. Patented Mar. 16, 1897.

Fig. 1



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C. E. Buckland.

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(No Model.) 2 Sheets—Sheet 2.

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Fig. 2

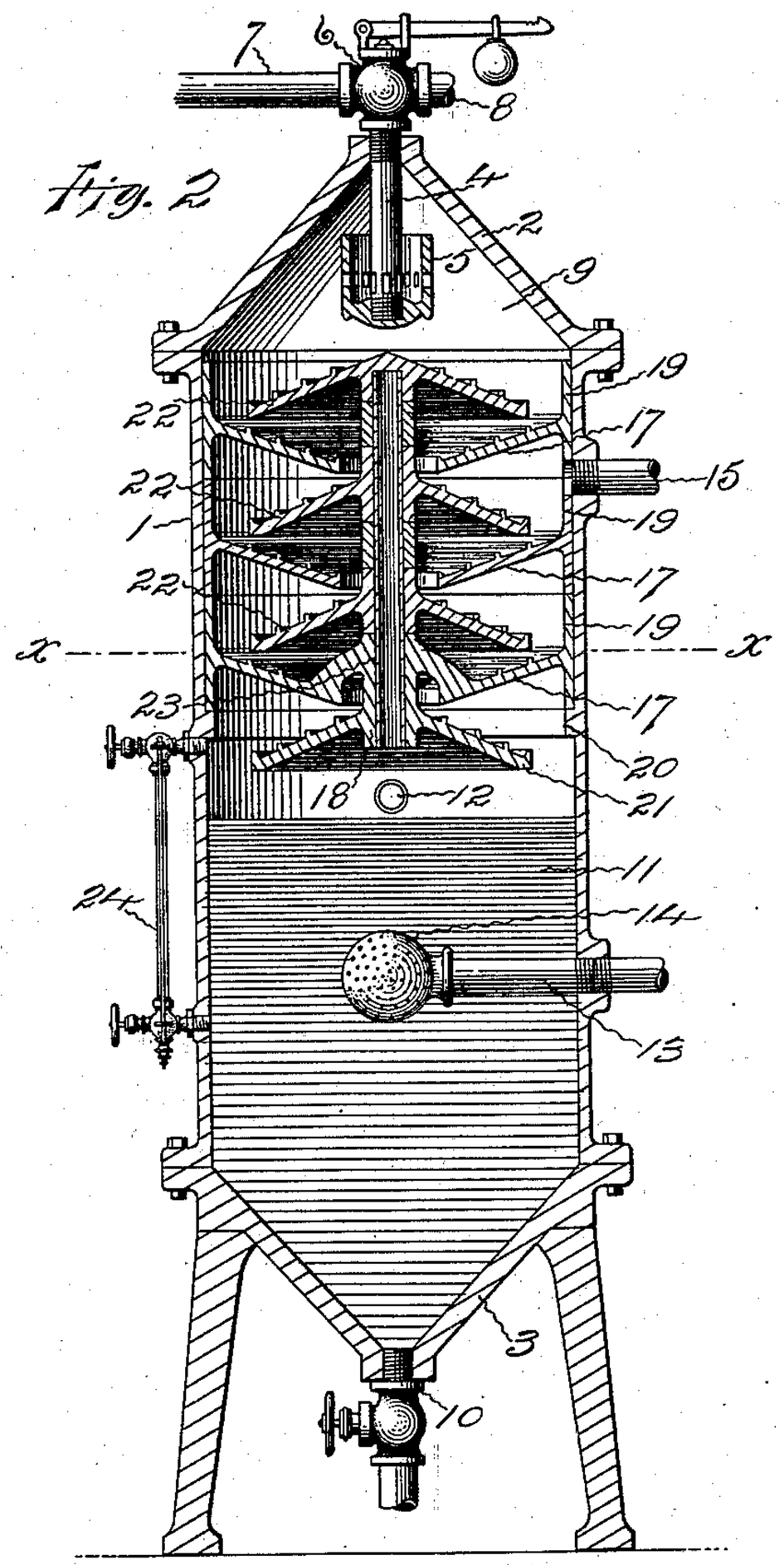
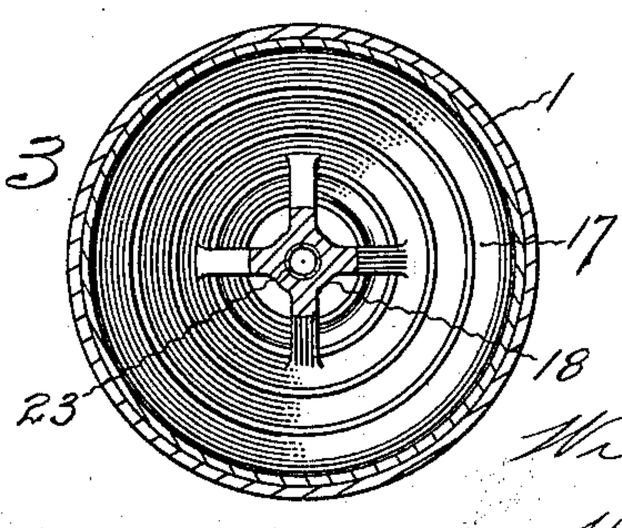


Fig. 3



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UNITED STATES PATENT OFFICE.

WILBUR L. SHEPARD, OF ELMWOOD, CONNECTICUT.

FEED-WATER PURIFIER.

SPECIFICATION forming part of Letters Patent No. 578,903, dated March 16, 1897.

Application filed June 29, 1896. Serial No. 597,302. (No model.)

To all whom it may concern:

Be it known that I, WILBUR L. SHEPARD, a citizen of the United States, residing at Elmwood, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Feed-Water Purifiers, of which the following is a specification.

The invention relates to the class of purifiers in which the feed-water is heated very hot by direct exposure to live steam from the boiler for which the feed-water is heated and purified.

The object of the invention is to provide a very effective, durable, and economical purifier of this class which shall be simple, inexpensive, and mechanically attractive.

To this end the invention resides in several features of the construction of a purifier that has a shell with a steam-chamber and hot-well, a feed-water inlet and steam-inlet, both entering the shell to the steam-chamber above the water-line, and a feed-water outlet leading through the shell from the hot-well below the water-line, a sprayer for scattering the water as it enters the steam-chamber, and removable baffle-plates or sediment-disks for directing the flow of water and collecting the impurities separated as it flows through the steam-chamber to the hot-well, as more particularly hereinafter described, and pointed out in the claim.

Referring to the accompanying drawings, Figure 1 is an elevation of a purifier embodying the invention, this view also illustrating the manner of connecting the purifier and the boiler. Fig. 2 is a central vertical section of this purifier, and Fig. 3 is a transverse section on plan denoted by the broken line X X of Fig. 2.

In the views, 1 indicates the shell, which is usually formed cylindrical of iron or steel of the requisite strength. The cylinder is preferably provided with a conical cap 2 at its upper end and a conical base 3 at its lower end, which may rest on any common form of legs or foundation.

Through the cap an opening is made for the feed-water inlet, and to this opening is usually connected a pipe 4, which on the interior of the shell bears a sprayer 5 and on the exterior a safety-valve 6. Connected with the safety-valve may be a pipe 7, leading from the source of supply of water, and a pipe 8, which may be utilized for a safety blow-off. The sprayer, which is located in the upper part of the steam-chamber 9, may be of any common form, that shown being a cup that is connected to the end of the inlet-pipe and provided with perforations in its walls through which the water as it enters will be caused to flow and thus spread into a spray.

An opening is made through the base for the attachment of a mud-blow-out pipe 10, by means of which matter that settles to the bottom of the hot-well 11 and collects in the conical base can be easily removed. An opening 12 is made through the shell just above the water-line to provide a scum blow-out. The outlet for the feed-water is made through the walls of the shell below the water-line, and the outlet-pipe 13 in the hot-well preferably bears a strainer or filter 14. This outlet-pipe leads to the boiler, into which it is supposed to enter below the water-line.

Steam is admitted by a pipe 15, that enters the steam-chamber above the water-line, and this pipe comes from the steam-dome 16 or steam-space above the water-line of the boiler from which the live steam is taken and for which the feed-water is heated and purified.

In the steam-chamber are placed a number of baffle-plates or sediment-disks. The upper surfaces of these disks decline outwardly and inwardly, so that the water as it passes down from one to the other is caused to flow outward from the center in a thin sheet and also inward toward the center in a thin sheet alternately. The upper surfaces of these disks are provided with annular ribs or recesses, so as to increase the extent of surface over which the water is obliged to pass, and also to provide depressions and obstructions for collecting the sediment or impurities precipitated from the water as it is heated in passing over them.

The disks 17 have their upper surfaces declining toward the center, so that feed-water in running over them is caused to flow downward toward the center and pass through openings around the central hubs 18. These disks are shown as provided with flanges 19 on their edges which fit the walls of the shell. A shoulder 20 is shown on the inner wall of

the shell, and the lower of these flanges rests upon this shoulder, while the upper flanges are supported by this lower flange. The other disks have their upper surfaces declining outwardly, so the water passing over them is caused to flow downward and outward toward the edges of the other disks. The lower disk 21 is shown as connected with the central hub on the lower of the disks 17, while the other disks 22 of this form are supported by superimposing them on this hub, a central tube 23 being used to retain them in position.

The apparatus is located so that the water-line in the shell will be on a level with the water-line in the boiler, and for this purpose a water-glass 24 may be attached to the purifier-shell opposite the water-glass 25 of the boiler and the purifier raised until the water shows in the glasses at the proper level. The steam-inlet leads from above the water-line in the boiler to the steam-chamber of the purifier above the water-line, and the feed-water outlet leads from the hot-well below the water-line in the purifier to below the water-line in the boiler. With the parts located and arranged in this manner the live-steam pressure in the steam-chamber of the purifier is the same as the pressure in the boiler, and of course the water in the purifier stands at the same level as the water in the boiler, and being under the same pressure the water will by gravity flow from the purifier to the boiler, obviating the necessity of pumping hot water.

Water entering the purifier is thrown out or divided by the sprayer so as to fall upon the surface of the upper disk or baffle-plate in a spray. The water then ripples down over this disk in thin sheets, running toward the outer walls of the shell. On reaching the edges of the disk it trickles to the next disk and then flows back toward the center of the shell. In this manner the water is caused to flow outward and inward several times as it passes over the roughened surfaces of the disks in its flow from the sprayer-inlet through the steam-chamber to the hot-well. This causes the water to be heated to a very high degree, for as it enters in a spray it is directly exposed to the steam at boiler-pressure, and then as it ripples over the disks and trickles from one to the other it is exposed in thin sheets for a considerable period to the action of the steam at boiler-pressure and also to the heat of the metallic sediment-disks. The water by this action is heated to such a high degree by the live steam that it is caused to part with its impurities, which are gathered or collected by the depressions between the ribs or other roughnesses of the disks. These disks, being heated very hot by the live steam, cause the sediment to somewhat harden and remain in such condition that it is not carried by the water into the hot-well. However, the hot-well is of such a size and shape and is protected from the entering steam and feed-water to such an extent by the baffle-plates or disks that it is not much agitated, and impurities precipitated from the water which fail being picked up or collected by the sediment-disks will settle to the bottom of the hot-well, from whence they can readily be blown out at the desired time. In the purifier shown and described the water is heated just as hot as it would be heated in the boiler. Therefore all the impurities which would be precipitated in the boiler will be precipitated in the purifier and there collected, where they can be readily removed.

Scum rising from the water in the hot-well can be removed through the scum blow-out. Sediment collected in the conical base of the shell can readily be removed through the mud blow-out, and by removing the cap the sediment-disks can be lifted out and easily cleaned. There are no moving parts or automatic devices in this structure. It can be operated by any one, the only duty to perform being that of pumping the cold water into the purifier when desired and stopping the pumping when enough water is supplied. The construction is simple and the operation is effective, for the spraying in of the water and subjecting it to the action of the live steam in the thin sheets most thoroughly heats the water and causes it to part with all of the impurities that are possible to precipitate by live steam.

The device is simple. It is economical to run, because it requires no attention, and it is formed in such shape as to occupy but comparatively little space for the capacity of the purifier.

I claim as my invention—

A feed-water purifier consisting of a cylindrical shell with a conical cap and a conical base, a water-inlet passing through the conical cap and bearing a sprayer within the shell and a controlling-valve without the shell, a blow-out passing through the conical base and bearing a controlling-valve without the shell, a live-steam inlet passing through the shell above the middle, a feed-water outlet passing through the shell below the middle, said outlet being provided with a strainer, a shoulder formed on the inner walls of the shell, sediment-disks with central openings, flanged edges and annular ribs on their concaved upper surfaces, said flanges being superimposed and supported by the shoulder on the shell, and sediment-disks smaller in diameter than the former disks with central hubs and annular ribs on their convexed upper surfaces, said hubs being superimposed and supported at the center, substantially as specified.

WILBUR L. SHEPARD.

Witnesses:
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E. J. HYDE.