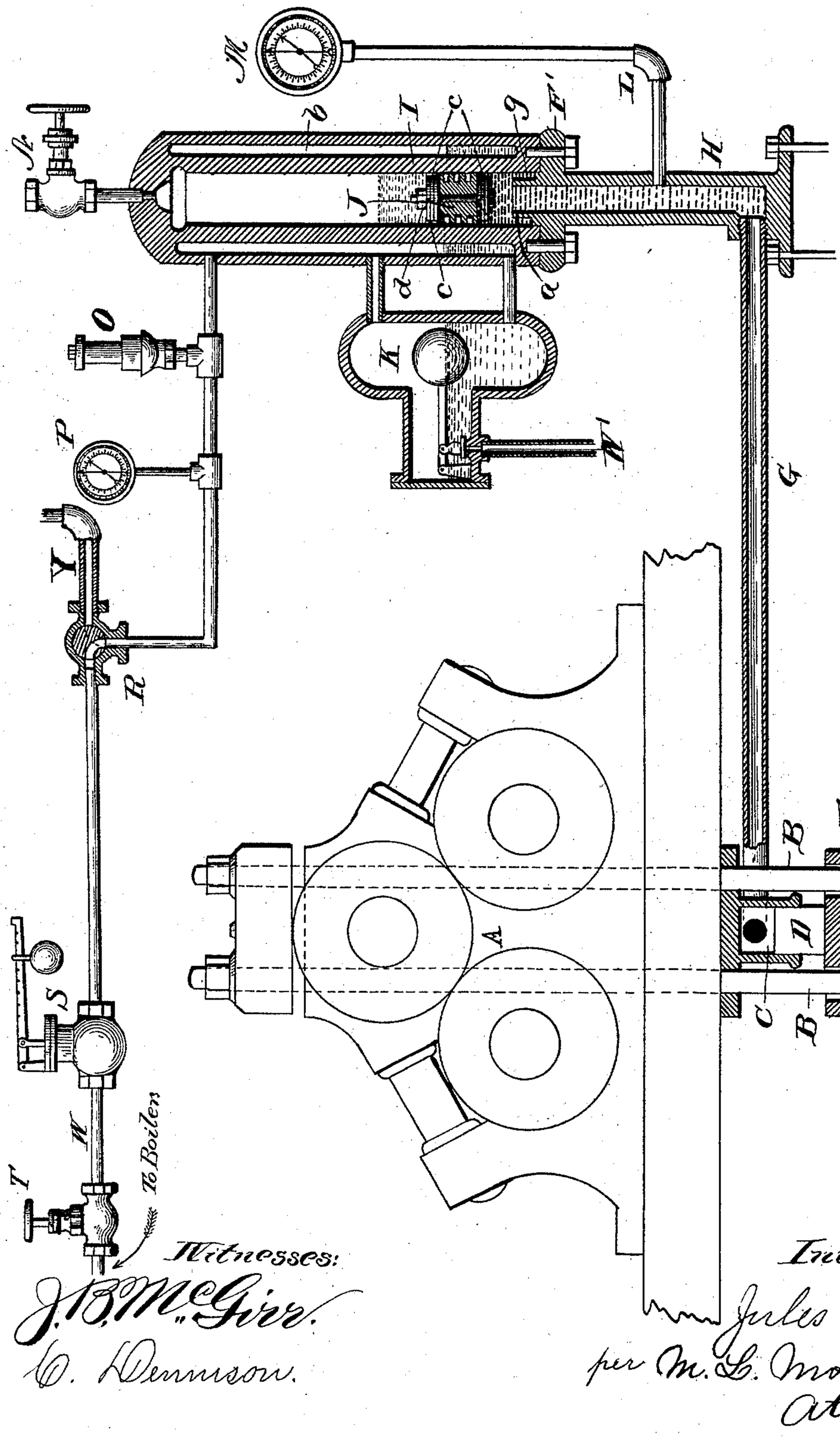
(No Model.)

J. BUCHEL.

PRESSURE REGULATOR FOR CANE MILLS.

No. 497,301. Patented May 16, 1893.



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UNITED STATES PATENT OFFICE.

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PRESSURE-REGULATOR FOR CANE-MILLS.

SPECIFICATION forming part of Letters Patent No. 497,301, dated May 16, 1893.

Application filed August 17, 1892. Serial No. 443,343. (No model.)

To all whom it may concern:

Be it known that I, JULES BUCHEL, a citizen of the United States of America, residing at New Orleans, in the parish of Orleans and State of Louisiana, have invented certain new and useful Improvements in Pressure-Regulators for Cane-Mills, of which the following is a specification, reference being had therein to the accompanying drawing.

My invention relates to hydraulic pressure regulators for cane mills or other devices in which heavy crushing rolls are used, and has for its object to provide means whereby the pressure of the rolls upon each other is kept constant by the direct pressure of ammonia or other suitable gas in a high state of tension.

Another object of my invention is to regulate the tension of the expansible gas or vapor by means of heat from the steam from the boiler.

My invention also consists in certain novel features of detailed construction which will hereinafter be more fully described and claimed.

In all machinery of this class it is very desirable that the pressure of the rolls upon each other should be constant for all conditions of the feed, that is whether the machine is being worked to its fullest capacity or whether only a small quantity of feed is passing through the rolls. To attain this object one or more of the rolls are usually set in adjustable bearings and various means have been employed for regulating the pressure on these bearings.

I will now more particularly describe my invention reference being had to the accompanying drawing which shows a cane mill in elevation with my improved regulator attached, shown mostly in section.

The style of mill, A, here shown is that in which three rollers are used, the top one having the adjustable bearings carried by the king bolts, B, B, which extend down through the housing and bed plate of the mill. On each side of the mill beneath the bed plate is placed a cylinder, C, of a hydraulic ram and in this cylinder works the plunger, D, which is carried by the king bolt washers E, which are firmly keyed to the king bolts at F F. The stand pipe H is connected to the hydraulic cylinders by supply pipes G, and also to pressure gage M by pipe L. This hydraulic gage has a double graduated dial so as to show both the pressure per square inch in the stand pipe H and also the total pressure in tons on the rams C. Near the upper end of the stand pipe H is a flange, F′, which supports the ammonia pressure cylinder I surrounded by its steam jacket *b*. Steam from the boiler is led to the steam jacket *b* through pipe W which contains valve T and an ordinary steam pressure regulator S. A pop safety valve is placed at O and a three way cock at R so that by a quarter turn the steam may be shut off and allowed to discharge from the steam jacket to the atmosphere through pipe Y. A pipe containing a valve N is attached at the top of the ammonia pressure cylinder through which the supply of anhydrous ammonia is introduced into the cylinder.

J is an ordinary piston valve working in the cylinder I. On its top and bottom are placed a number of leather washers, *c*, *c*, *c*, held to the piston by the bolt *d*. The seat *a* of the piston valve is formed by the extension of the stand pipe up into the cylinder I. The said extension is tapered so as to be smaller than the cylinder and leave an annular space, *g*, surrounding the valve seat, *a*, which will remain filled with the oil when the valve descends upon the seat, *a*, and thus prevent any leaking of the ammonia at the joint of the head of the cylinder.

The object of the washers bolted to the piston valve is to make a perfectly tight joint when the valve is on its seat and also to prevent the valve or seat from being injured should the valve move up or down too suddenly.

As the ammonia is heated in the cylinder I it exerts an immense pressure upon the oil in the stand pipe H which is transmitted to the hydraulic rams. The piston valve J is not needed for the transmission of the pressure but is used to prevent any escape of the ammonia in case the oil should fall below the top of the stand pipe from leakage or any other cause.

Gage P is graduated to register the steam pressure in the steam jacket *b* as controlled by the pressure regulator S, and the gage also has another graduated arc which gives the relative pressure of the ammonia in the re-

ceiver I due to the temperature of the steam in the jacket which is always constant and in proportion to the steam pressure. Steam in the jacket *b* at 212° Fahrenheit or atmospheric pressure will by its temperature raise the pressure of the ammonia in cylinder I to about one thousand pounds per square inch, thus the double graduated dial P gives both the pressure of the steam in jacket *b* and pressure of ammonia in cylinder I. The number of pipe connections to the pressure cylinder is thus reduced to one, namely that at N, directly through the top and the liability to leakage and the great expense of making these joints are very much reduced.

At K is shown an ordinary float valve and chamber for regulating the discharge of the water of condensation from the steam jacket, through pipe W'.

The operation of my device is as follows:—The hydraulic cylinders C, pipes G and stand pipe H are filled with a certain amount of suitable heavy oil sufficient to raise the piston valve J a couple of inches or so from its seat in the cylinder I. The ammonia valve N is then connected with a cylinder containing liquefied ammonia and a couple of pounds of the liquid are allowed to flow in, after which the valve is closed and hermetically sealed. The ammonia at summer temperature has a pressure from two hundred to three hundred pounds per square inch which will exist as long as there is any liquefied ammonia in cylinder I. The pressure regulator S is now set so as to give the desired steam pressure and the corresponding temperature in the jacket, *b*. The steam is then turned on and by its heat raises the pressure of the ammonia from two hundred to three hundred pounds anywhere from one thousand to five thousand pounds per square inch which is indicated by the double graduated gage P, and regulated to any desired amount by the pressure regulator S. This inner pressure in the ammonia cylinder reacts directly upon the oil below which transmits it to the plungers D, and by means of the king bolts the upper roller is pressed against the other two. This pressure remains practically constant while the rollers vary in distance apart due to different conditions of the feed. The expansibility and compressibility of the gas in chamber I allow for any irregularities of this kind without subjecting the machine to any sudden shocks and lessen very much the danger of breaking at the same time keeping an even and steady pressure on the rollers.

I am aware that it is old to generate power by introducing a volatile liquid into a vessel containing a heavy liquid which is connected to another vessel containing a piston, and by heating the said liquids produce a motion of the piston. The method employed in my device is not for the generation of power, but is to maintain a constant pressure in the cylinder to act as a cushion or a resistance to the force or power evolved by the regular movement of the rolls as they move toward or recede from each other according as there is more or less feed passing through the mill.

In vapor motors or power generators it is necessary that the pressure should be varied, that is alternately increased and decreased or released in order to produce motion. But the essential feature in my process is that the pressure resulting from the expansion of the volatile liquid must be maintained substantially constant and stationary in order that the rolls may be constantly subjected to an even pressure. Thus the vapor under tension in the pressure cylinder acts merely as a static pressure or a passive medium being entirely actuated by the force of the mill seeking relief. This static pressure takes the place of a weight or spring and is compressed or expanded according to the irregular movement of the rolls. When the mill is started at the beginning of the operation, the pressure in the cylinder I is set at a certain amount, suitable to the quality of the cane or feed and this pressure is not materially varied throughout the operation of the machine.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a pressure regulator for cane mills, the combination of the stand pipe H connected to the hydraulic ram, the pressure cylinder I supported on said stand pipe, the steam jacket *b* surrounding the pressure cylinder, the steam supply pipe W connected to the steam jacket, and the valve T in said pipe, whereby the supply of steam to the jacket may be controlled, substantially as described.

2. In a pressure regulator for cane mills stand pipe H connected to a hydraulic ram, the pressure cylinder supported on said stand pipe, the steam jacket around said cylinder and the piston valve J working in the cylinder whereby the upper end of the stand pipe may be closed, substantially as described.

3. In a pressure regulator for cane mills the stand pipe H connected to the hydraulic ram, the steam jacketed pressure cylinder supported on said stand pipe, the extension *a*, of the stand pipe within the cylinder forming a valve seat, the surrounding annular space *g*, and the piston valve, substantially as described.

4. In a pressure regulator for cane mills, the stand pipe H, connected to the hydraulic ram, the double graduated dial gage M connected to said stand pipe as described, the pressure cylinder I, the piston valve J working in said cylinder, the steam jacket *b* around the cylinder, the steam pipe W, and the steam pressure regulator S in said pipe, whereby a certain pressure of steam may be maintained in the steam jacket substantially as described.

5. In a pressure regulator for cane mills the steam jacketed ammonia pressure cylinder having the opening at the top controlled by the ammonia valve N, steam pipe W connected to the jacket *b* and containing the press-

ure regulator S, and the stand pipe H connected with the hydraulic ram as set forth.

6. In a pressure regulator for cane mills the combination of the stand pipe H. supporting the steam jacketed ammonia pressure cylinder, the steam pipe connected to the jacket and containing the pressure regulator S, the three way cock R and the double graduated pressure gage P whereby the pressure in the steam jacket *b* and in pressure cylinder I are both indicated substantially as set forth.

7. In a pressure regulator for cane mills the combination of the stand pipe H connected to the hydraulic ram by pipes G, the steam jacketed ammonia pressure cylinder, piston valve J and seat A in said cylinder, steam pipe W containing pressure regulator S, three way cock R, the double graduated gage P and safety valve O and the float valve and chamber K for the discharge of the water of condensation substantially as set forth.

8. The herein described process of maintaining a constant and regular pressure on the rolls of a cane or other mill, which consists in directing the forces produced by the irregular movements of the rolls, upon a confined heavy liquid, subjecting a certain amount of confined volatile liquid to a predetermined degree of heat, maintaining the resulting pressure substantially constant and stationary and directing the motion of the heavy liquid directly against the confined vapor so that it will be compressed or allowed to expand according to the irregularities of the feed.

9. The herein described method of maintaining a constant pressure upon the rolls of a cane or other mill, which consists in confining a certain amount of volatile liquid, subjecting the liquid to a certain degree of heat, maintaining this vapor under tension at a substantially constant or stationary pressure, as a passive medium, and transferring the force produced by the irregular movement of the rolls in such a manner that it will act directly to compress or expand the confined vapor, thus keeping the same constant pressure upon the rolls.

In testimony whereof I affix my signature in presence of two witnesses.

JULES BUCHEL.

Witnesses:
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