No. 814,285. PATENTED MAR. 6, 1906.

E. E. GOLD.

PRESSURE REGULATOR.

APPLICATION FILED APR. 15, 1905.

2 SHEETS—SHEET 1.

FIG. 1.

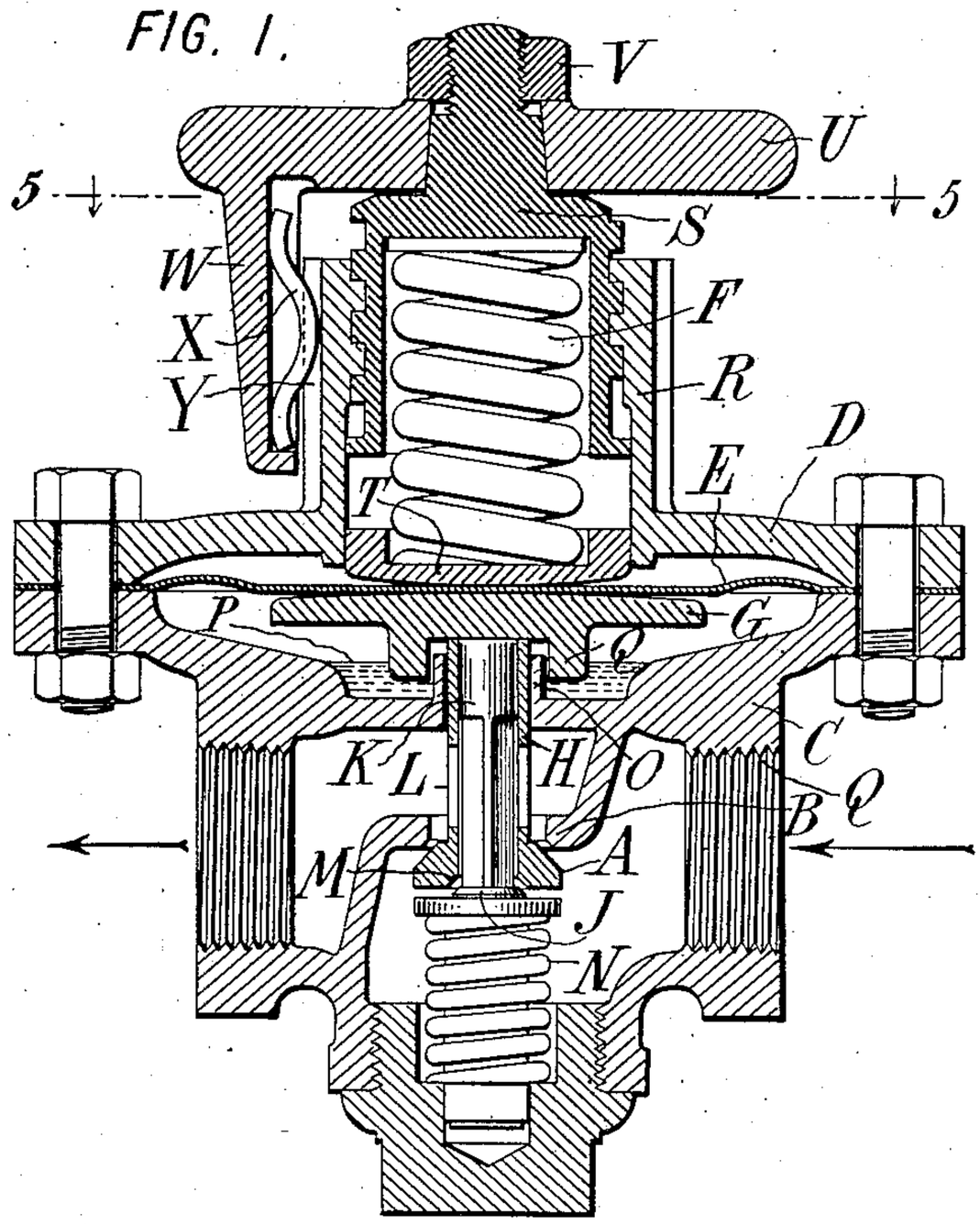


FIG. 2.

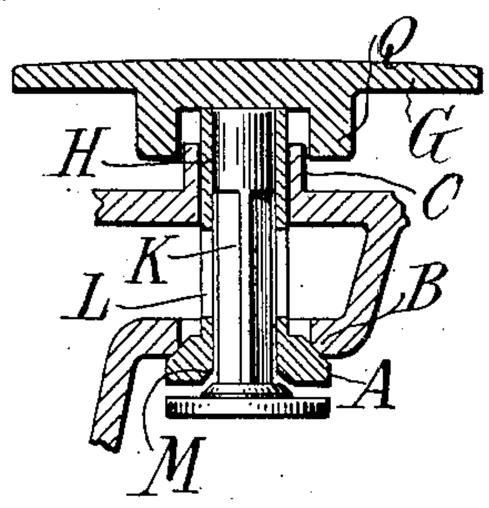


FIG. 3.

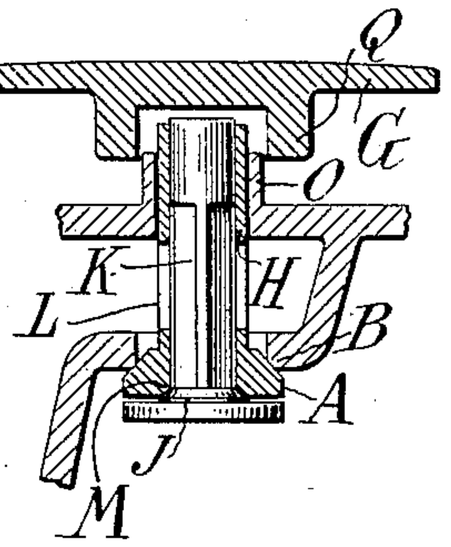


FIG. 4.

WITNESSES:
Fred Whitty
René Pruine

INVENTOR:
Edward E. Gold,
By Attorneys,
Arthur C. Fraser & Co

No. 814,285. PATENTED MAR. 6, 1906.

E. E. GOLD.

PRESSURE REGULATOR.

APPLICATION FILED APR. 15, 1905.

2 SHEETS—SHEET 2.

FIG. 5.

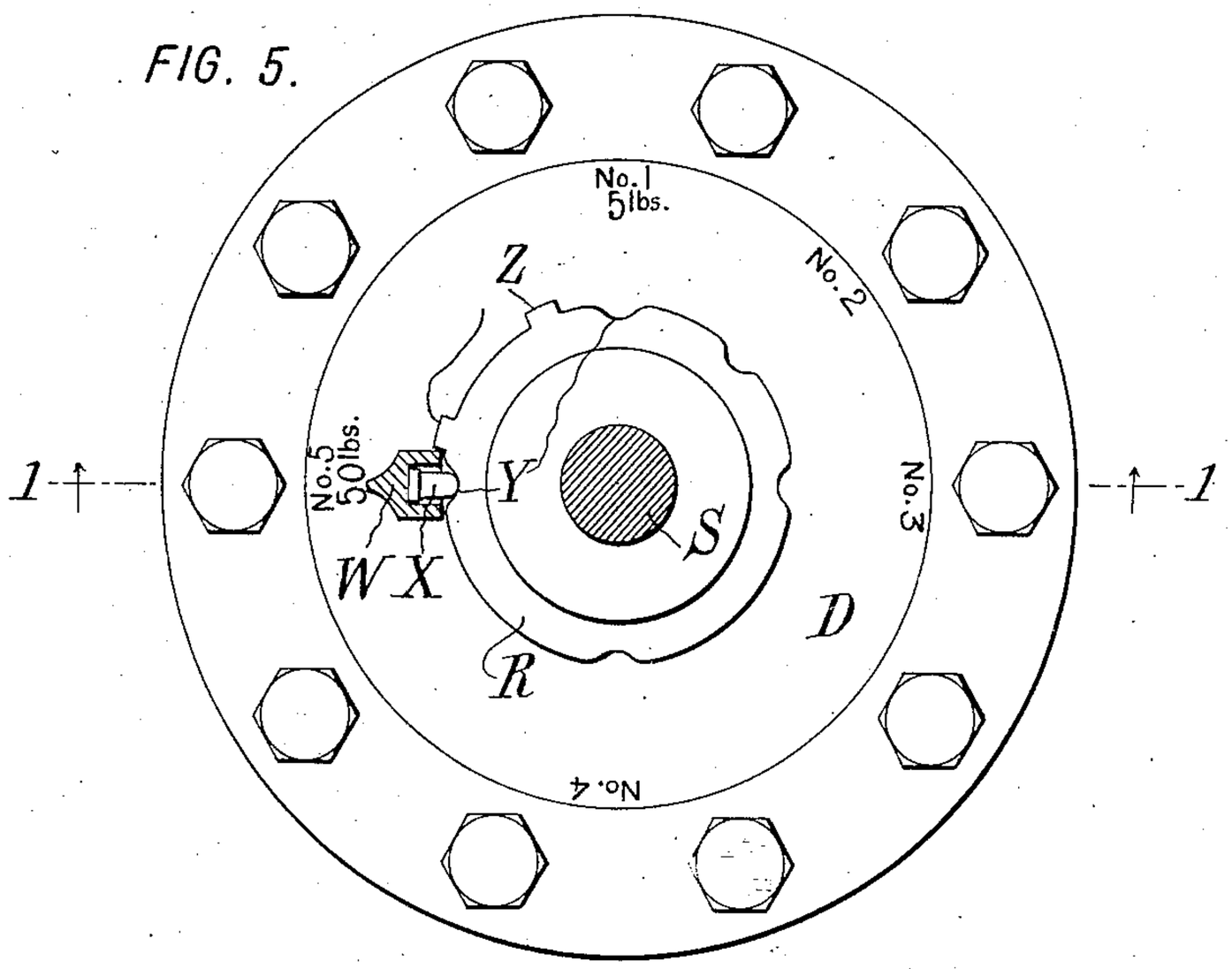


FIG. 6.

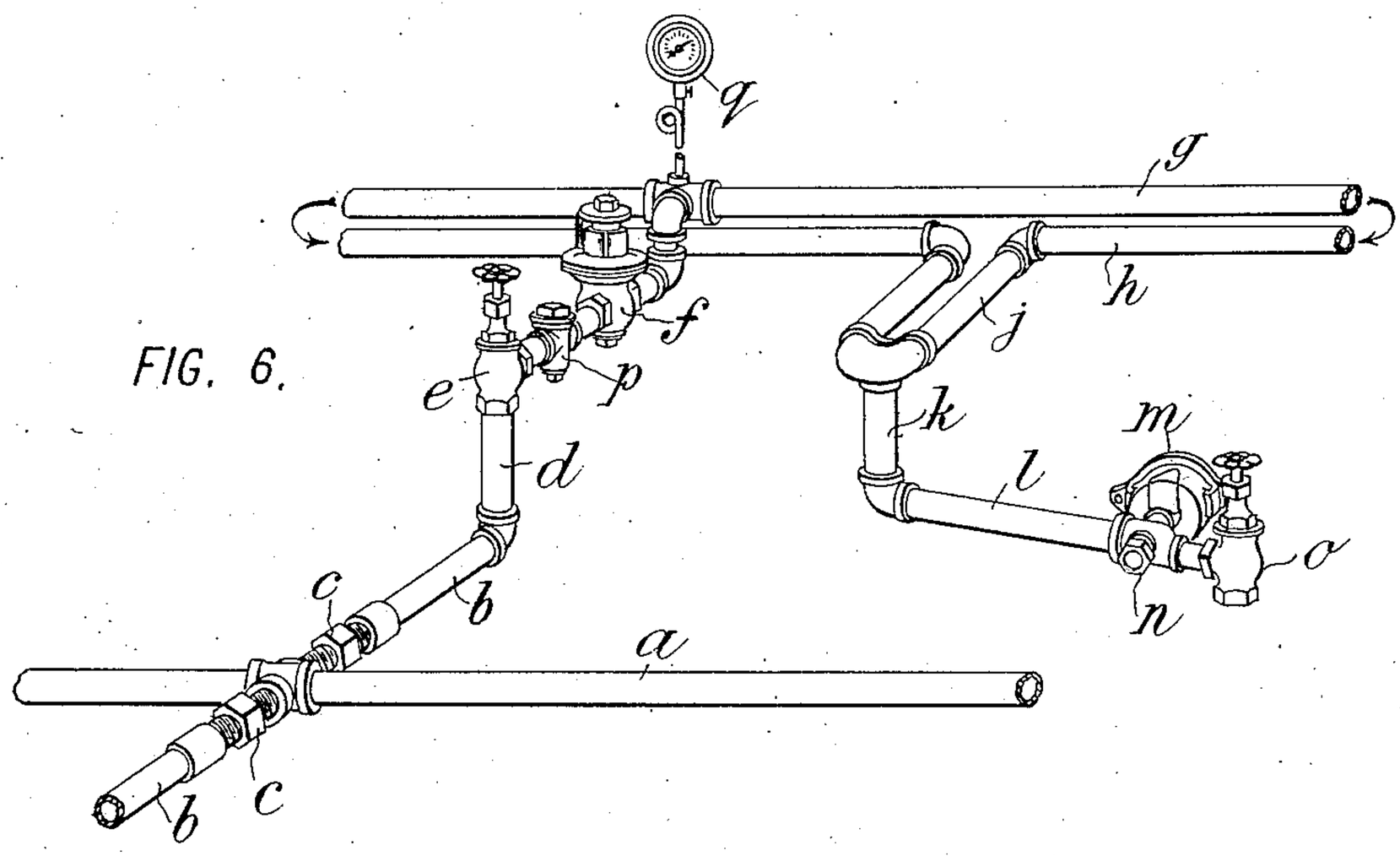


FIG. 7.

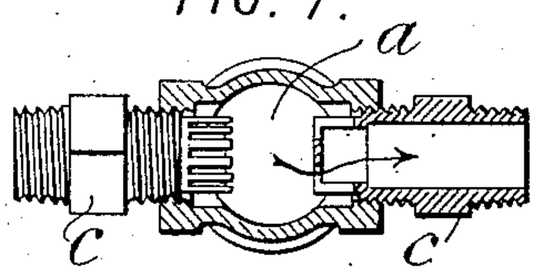
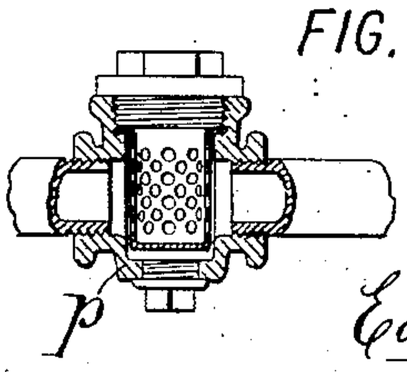


FIG. 8.



WITNESSES:

Fred Whitz

René Bruine

INVENTOR:

Edward E. Gold,

By Attorneys,

Arthur G. Fraser & Co.

UNITED STATES PATENT OFFICE.

EDWARD E. GOLD, OF NEW YORK, N. Y.

PRESSURE-REGULATOR.

No. 814,285. Specification of Letters Patent. Patented March 6, 1906.

Application filed April 15, 1905. Serial No. 255,778.

To all whom it may concern:

Be it known that I, EDWARD E. GOLD, a citizen of the United States, residing in the borough of Manhattan, city, county, and State of New York, have invented certain new and useful Improvements in Pressure-Regulators, of which the following is a specification.

This invention relates to pressure-regulators of the general type shown in my previous patents, Nos. 508,133 and 508,135, which reduce the fluid from a higher to a lower pressure by means of a valve controlled by the pressure on the eduction side.

My improved regulator is arranged to admit pressure to both sides of the valve when it is closed, so as to balance it. The valve preferably closes with or in the direction of the pressure and closes upon a seat which prevents further movement of the valve. The admission of pressure to the eduction side of the main valve when it is closed is preferably accomplished by means of an auxiliary valve which is engaged by a member of the regulating device and which is opened before the main valve when the pressure on the eduction side falls too low and which only closes after the main valve has closed, (when the pressure on the eduction side has become too high.) The main valve will therefore be balanced by an equal or substantially equal pressure on opposite sides whenever it is to be opened by the regulating mechanism or to be held open thereby and will therefore be as sensitive and as well adapted for nice regulating as the ordinary type of balanced valve. The auxiliary valve has also the function of admitting the fluid with gradually-increasing force or cutting it off with gradually-diminishing suddenness—that is to say, when more fluid is called for on the eduction side a small quantity is first admitted through the auxiliary valve and then a large quantity through the main valve, and in the closing of the valve the opposite order is followed.

Various other features of improvement are referred to in detail hereinafter.

The accompanying drawings illustrate an embodiment of the invention.

Figure 1 is a diametral section of the regulator with the fluid passing freely from one side to the other. Fig. 2 is a similar view of the valve, showing the position when the pressure in the eduction side has nearly reached the desired limit. Fig. 3 is a similar view showing the position of the valve when the desired pressure has been reached in the eduction-pipe. Fig. 4 is a transverse section through the stems of the valves. Fig. 5 is a horizontal section on the line 5 5 of Fig. 1. Fig. 6 is a perspective view of the principal portion of the car-heating apparatus or system utilizing the regulator. Figs. 7 and 8 are sections of strainers.

Referring to the regulator illustrated, A is the main valve, which closes toward and is limited in its movement by a seat B. The arrows indicate the admission and eduction sides of the regulator. The body C of the regulator is bolted, by means of a flange, to a dome D, between which is a diaphragm E, pressed downward by a spring F and subjected to an upward pressure by the steam or other fluid in the eduction side of the regulator. A member G on the under side of the diaphragm transmits the movement thereof to the end of the stem H of said main valve. As the pressure in the eduction side increases the diaphragm E and the member G are lifted and the pressure of the steam on the admission side forces the valve A to its seat. On the other hand, when the pressure in the eduction side falls the diaphragm and the member G are pressed down by the spring F and open the valve A to admit more pressure. The first admission of pressure to the eduction side of the valve A is accomplished by means of an auxiliary valve J, the stem K of which, or at least the lower portion of the stem, is a spider of the usual type extending upward through a passage in the valve A and its stem H. The stem H is provided with apertures L on a level with the spider, so as to permit the passage into the eduction-pipe of steam which passes through the auxiliary valve J. It is to be understood that the auxiliary valve J has its seat M at the lower end of the passage through the main valve A. A light spiral spring N holds up the valve J and through it the valve A to positions adjacent to their seats. The stem K is of such length as to project slightly above the stem H when the auxiliary valve is on its seat. By reason of the projecting of the stem K above the stem H the downward movement of the member G when there is a fall of pressure causes it to first strike the end of the stem K and open the auxiliary valve J of small area, and therefore small resistance. The opening of this valve admits steam through the spider-shaped stem and through the openings L and tends to balance the larger valve A, which can then be easily opened on the further

downward movement of the pressure-operated member G. For example, when steam is first turned on the member G will be pressed down to its lowest position, and the excess of pressure on the admission side will force the valves A and J upward until their stems strike said member, both valves being stopped in an open position, as indicated in Fig. 1. As the pressure rises in the eduction side the member G will rise and the two valves A and J will move upward at the same rate, maintaining the same amount of opening of the auxiliary valve until the main valve A will bear on its seat B, Fig. 2. The seat stops the further movement of the main valve, and at the same time the passage for the flow of steam is much restricted and the continued rise of pressure is more gradual. Finally when the desired pressure is reached the stem K will be freed from any downward pressure through the member G and the auxiliary valve J will close. In opening, the reverse operation will take place.

The body C of the regulator is provided with an upward flange O, surrounding the valve-stem H and forming a gutter for the accumulation of water of condensation P, into which projects an annular flange Q from the member G to form a water seal and prevent water-hammer or chattering. The dome D is provided with an upwardly-extending neck R, into which screws a spindle S, the greater portion of which is hollowed out to receive and guide the spring F. Corresponding to the disk-shaped member G on the under side of the diaphragm is a similarly-shaped but smaller member T on the upper side of the diaphragm transmitting the pressure of the spring to the center of the diaphragm. The disks G and T are convex on their meeting faces, as shown, and serve to permit the bending of the diaphragm G in curves of large radius, so as to minimize the danger of breakage. The hand-wheel U is fastened on the upper tapered portion of the spindle S by means of a nut V and carries a pointer W and an impositive locking device comprising a spring X, held in a recess on the inside of the pointer and adapted to engage grooves or recesses Y, placed at suitable points on the circumference of the neck R. The spring X may be a round wire flattened at the ends and approximately filling the groove in the pointer, so as to prevent substantial lateral displacement. By loosening the nut V the hand-wheel can be turned slightly to the right or left to adjust accurately the pressure on the spring F for any given position of the hand-wheel and pointer. The top face of the dome D may be provided with suitable figures or other characters for indicating by the position of the pointer W the degree of compression of the spring F, and consequently the degree of pressure which will be maintained in the eduction-pipe.

For use in connection with my new car-heating system I propose to employ a series of arbitrary marks indicating the position to which the pointer has to be turned in accordance with the weather, as "Moderate," "Slightly cold," &c. For example, I may use the marks "No. 1," "No. 2," "No. 3," "No. 4," and "No. 5" with or without a card of directions as to the position in which the regulator is to be set for different conditions of temperature. This system has the advantage of simplicity. The question of pressures in the pipes does not give any indication of the temperature to the average trainman, and better results will be secured by an arbitrary system of indicating the position of the regulator. Stops Z prevent the pointer from going below the minimum pressure or above the maximum. They are preferably so arranged as to never permit the use of the regulator for cutting off the steam entirely—that is to say, to always permit a pressure of two or three pounds in the eduction-pipe—and to limit the pressure which may be admitted to an amount slightly below that in the main train-pipe. The stem S is made of large diameter and is provided with a square thread of a pitch sufficient to effect the entire range of adjustment desired in less than a complete turn of the hand-wheel. In practical operation this is a great advantage over previous constructions, with which it has been necessary to make several turns of the adjusting-wheel to change from the highest to the lowest position of adjustment. The present construction, besides requiring only a slight movement, permits of the very simple and clear arrangement of the pointer and indices above described.

A suitable arrangement of the parts in a car-heating system is illustrated in Fig. 6. The main train-pipe *a* runs the entire length of the train and is supplied with steam from the locomotive at high pressure. Usually a pressure-regulator in the engineer's cab controls the pressure in the train-pipe. The train-pipes on the several cars are connected by rubber or other flexible hose and suitable couplers between successive cars. Horizontal branches *b* conduct steam to substantially identical independent systems of piping on opposite sides of the car. The train-pipe valve, previously located directly in the train-pipe and necessitating, in addition, strainers in the train-pipe, is eliminated, and the flow of steam through the train-pipe is unobstructed. It is understood that the steam carries along through the train-pipe a quantity of scale, small pieces of rubber, and other dirt, so that it is essential to the proper working of the valves, and especially of a pressure-regulator, that this dirt be kept out. In the present system strainers *c* are introduced at the entrance to each of the branches *b*, and instead of stopping the dirt and forming an accumu-

lation of mud in the train-pipe this mud will be carried along to the rear end of the train and there blown out. The pipes *a* and *b* are below the floor of the car. From the ends of the pipes *b* on each side there is a vertical pipe *d*, at the upper end of which is an angle-valve *e* of the usual or any suitable type, the spindle of which projects upwardly to a point accessible from within the car. The steam passes from the valve *e* through the regulator, which I designate as a whole by the letter *f*, to the heater or system of radiating-pipes arranged in any suitable manner in the car and typified in the present case by a pair of longitudinal radiating-pipes *g h*, from the latter of which the steam and water of condensation runs through downwardly-inclined horizontal branches *j* and a vertical branch *k* to a downwardly-inclined discharge-pipe *l*, carrying near its end a thermostatic trap *m* at one side and a gravity trap *n* at the opposite side and at its end beyond these traps a blow-out valve *o*, the stem of which projects upward to a point accessible from within the car. The pipes *g* and *h* may also be suitably inclined to insure the running off of the water of condensation. The water of condensation is purged at intervals—while the pressure is on through the thermostatic trap, and when the pressure is cut off through the gravity-trap. When the steam is first turned on, the blow-out valve *o* may be opened to permit the rapid escape of air in the pipes, or this valve may be opened at any time to blow out the pipes. The arrangement of the parts in connection with the discharge-pipe *l* is described more fully and claimed in my application for patent, Serial No. 234,864, filed November 30, 1904. The vertical pipe *d*, with the valve *e* at its upper end, retards the passage into the regulator of any dirt which escapes through the strainers *c*, the natural tendency being to drop to the bottom of the vertical pipe *d*. In addition a strainer *p* is introduced between the hand-valve *e* and the automatic regulator *f*. A steam-pressure gage *q* is usually applied at the admission-point of the radiating system.

The arrangement of piping described is not claimed herein, being claimed in my application Serial No, 273,542, filed August 10, 1905.

Though I have described with great particularity of detail certain embodiments of the invention, yet it is not to be understood that the invention is limited to the specific embodiments disclosed. Various modifications thereof in detail and in the arrangement and combination of the parts are possible to those skilled in the art without departure from the invention.

What I claim is—

1. A pressure-regulator including in combination a main valve, an auxiliary valve arranged to admit pressure from the admission side of the main valve directly to the eduction side, and a pressure-operated member detached from said valves and arranged to engage first said auxiliary valve and subsequently said main valve as the pressure on the eduction side falls.

2. A pressure-regulator including in combination a main valve A having a passage therethrough, an auxiliary valve J arranged to admit pressure from the admission side of the main valve directly to the eduction side for closing said pasage, and a pressure-operated member for engaging the stems of said valves, the stem of the auxiliary valve being extended beyond that of the main valve to be first engaged by said member as the pressure on the eduction side falls.

3. A pressure-regulator including in combination a main valve A having a passage therethrough, an auxiliary valve J arranged to admit pressure from the admission side of the main valve directly to the eduction side for closing said passage, a pressure-operated member arranged to engage first said auxiliary valve and subsequently said main valve as the pressure on the eduction side falls, and a spring N holding the valve J and through it the valve A to positions adjacent to their seats.

4. A pressure-regulator including in combination a main valve A having a passage therethrough, an auxiliary valve J closing said passage and arranged to admit pressure from the admission side of the main valve directly to the eduction side, a pressure-operated member comprising a disk G arranged to engage the stems of said valves and having a convex upper face, a disk T having a convex lower face pressing down upon said disk G and a diaphragm E between said disks, the stem of the auxiliary valve J being extended beyond that of the main valve to be first engaged by said member G as the pressure on the eduction side falls.

5. A pressure-regulator including in combination a main valve A having a passage therethrough, an auxiliary valve J closing said passage and arranged to admit pressure from the admission side of the main valve directly to the eduction side, a pressure-operated member for engaging the stems of said valves, the stem of the auxiliary valve being extended beyond that of the main valve to be first engaged by said member as the pressure on the eduction side falls, a spring F bearing on said member, and a screw-threaded spindle S for adjusting the pressure on said spring, said spindle being hollow and embracing said spring.

6. A pressure-regulator including in combination a main valve, an auxiliary valve arranged to admit pressure from the admission side of the main valve directly to the eduction side, a pressure-operated member arranged to engage first said auxiliary valve and subsequently said main valve as the pres-

sure on the eduction side falls, and a spindle for adjusting the pressure upon said member and adapted to effect the entire range of adjustment within a single rotation, whereby the angular position of the spindle indicates the degree of adjustment.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

EDWARD E. GOLD.

Witnesses:
DOMINGO A. USINA,
FRED WHITE.