

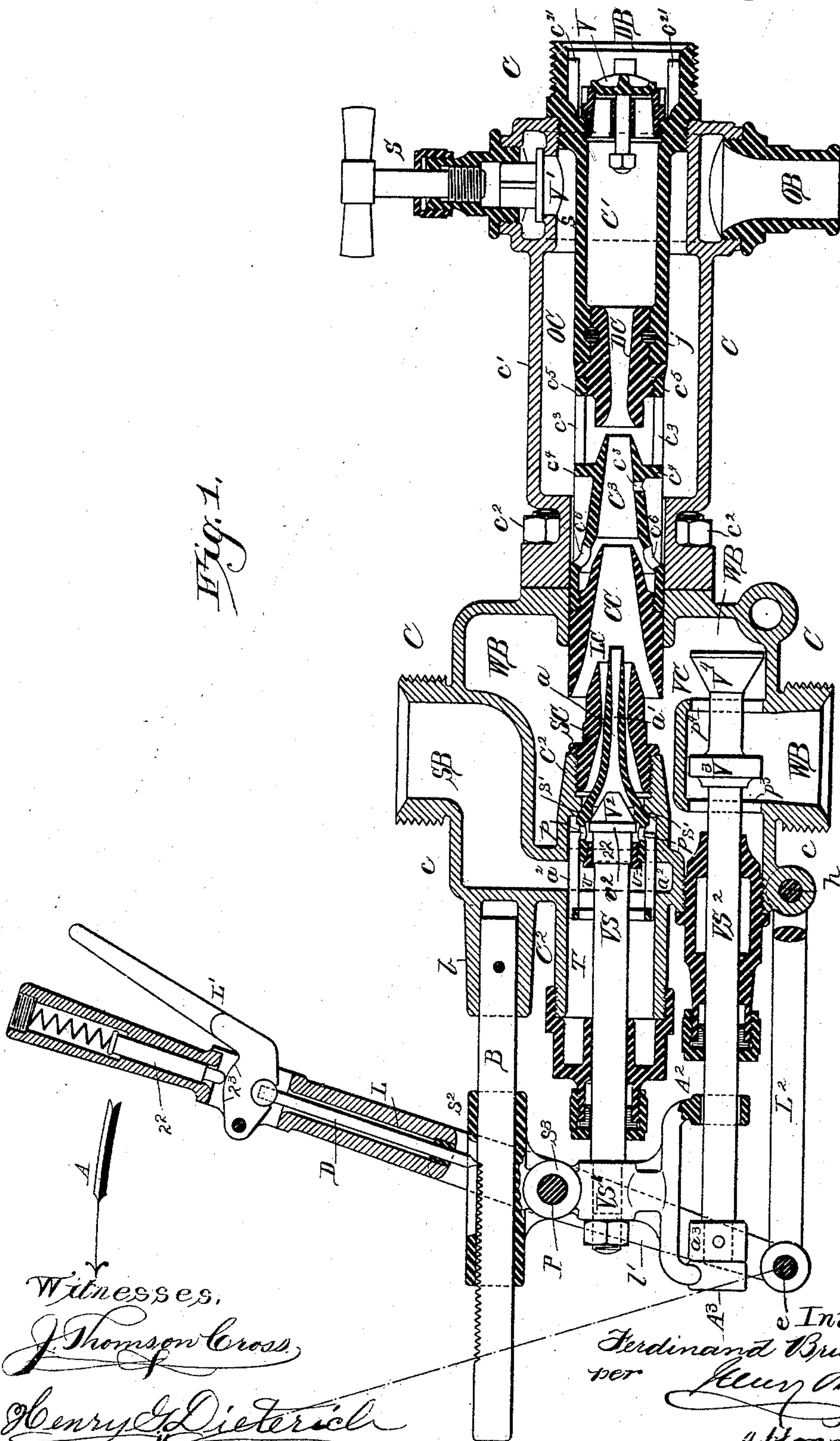
(Model.)

3 Sheets—Sheet 1.

F. BRUNBAUER.
INJECTOR.

No. 495,778.

Patented Apr. 18, 1893.



Witnesses,
J. Thompson Cross,
Henry G. Dieterich

Inventor:
Ferdinand Brunbauer
per Henry M. H.
Attorney.

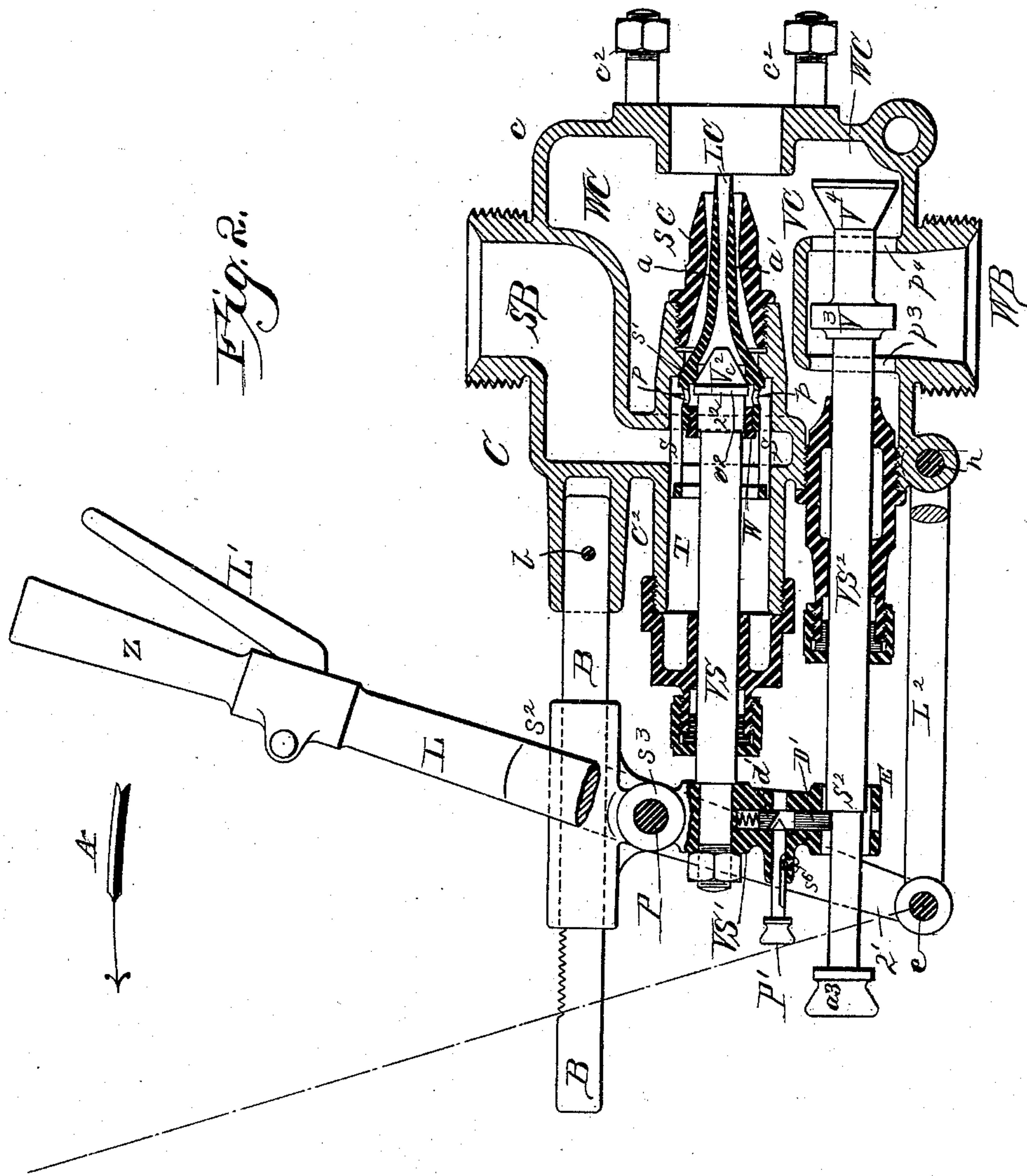
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F. BRUNBAUER.
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J. Thomson Cross
Henry G. Dietrich

Inventor:
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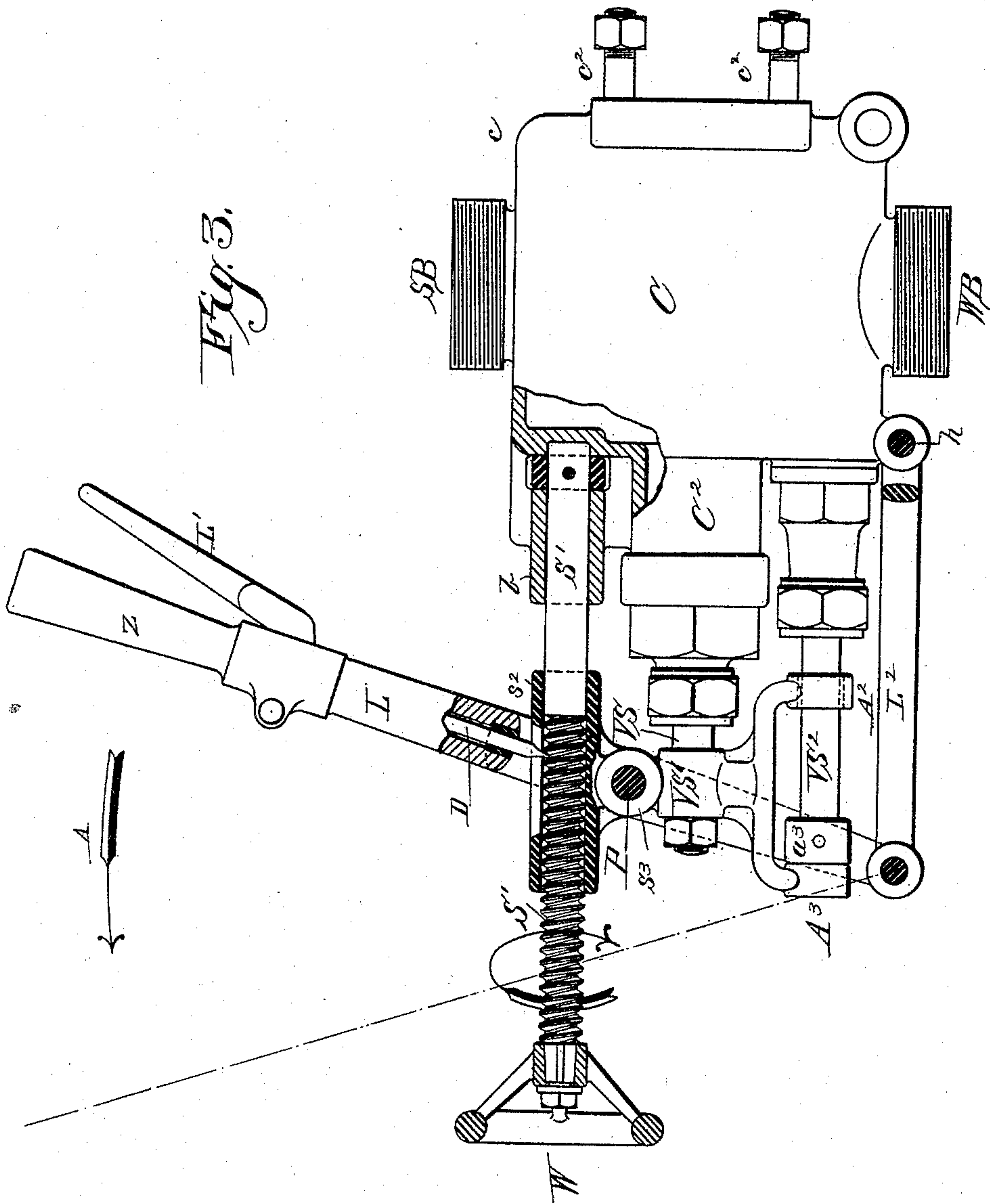
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3 Sheets—Sheet 3.

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Witnesses,

Thomson Cross

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UNITED STATES PATENT OFFICE.

FERDINAND BRUNBAUER, OF VIENNA, AUSTRIA-HUNGARY.

INJECTOR.

SPECIFICATION forming part of Letters Patent No. 495,778, dated April 18, 1893.

Application filed October 12, 1889. Serial No. 326,895. (Model.)

To all whom it may concern:

Be it known that I, FERDINAND BRUNBAUER, a subject of the Emperor of Austria-Hungary, residing at Vienna, in the Province of Lower Austria, in the Empire of Austria-Hungary, have invented certain new and useful Improvements in Injectors; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

Referring to the drawings: Figure 1, is a longitudinal axial section of an injector for steam-boilers, embodying my invention. Fig. 2, is a similar view of the rear portion thereof illustrating a modified construction of starting mechanism. Fig. 3, is a side elevation (partly in section) of Fig. 1 illustrating means for adjusting the valves independently of the hand lever.

The invention relates to that class of injectors in which a plurality of valves, for the admission to the injector, of steam and water, are employed, and in which the valves are combined with mechanisms for controlling or regulating the volume of steam and water to the injector.

In injectors of usual construction the mechanisms for controlling the valves are of such a nature as to require a skillful operator to handle the same. My invention has for its object to provide means whereby the handling of this mechanism is facilitated, and whereby the mechanism itself is greatly simplified, and the said improvements are applicable to injectors working with one or more steam-jets.

To these ends the invention consists in the combination with the steam and water admission valves or devices, of controlling mechanism operated by one and the same lever and operating the steam and water admission devices successively, and in means for operating the steam-valve independently of the water admission valve; also in structural features and combinations of parts substantially as hereinafter fully described and as set forth in the claims.

Referring more particularly to Fig. 1, I have shown the injector casing, C, made of two parts, c , and, c' , bolted together by means

of bolts, c^2 . The section, c , of the casing has the steam branch, S B, and water branch W B, while the section, c' , has the usual overflow branch, O B, and the delivery branch, D B, for connection with the boiler, in which last named branch is arranged the usual check-valve, V. In the overflow chamber is arranged a check-valve, V' , whose movements relatively to the valve-seat, s , may be controlled, or which valve may be locked to its seat, s , by means of a screw, S, so that the overflow can be regulated, or the valve closed when it is desired to use the injector as a feed water heater, as is frequently the case in locomotive injectors.

The delivery branch, D B, in which the check valve, V, is seated is a tubular casing, C' , screwed into section, c' , of casing, C, and projects into said section, c' . To the inner end of the casing, C' , is connected the delivery cone, D C, by means of a swivel joint, j , as shown. The said casing, C' , is of less diameter than the inclosing casing to form the overflow chamber, O C, between the two.

To the delivery cone, D C, is connected the condensing cone, C^3 , which cone has arms, c^3 , projecting from an annular flange, c^4 , said arms forming part of an interiorly screw-threaded ring, c^5 , screwed onto delivery cone, D C.

The condensing cone, C^3 , has one or more overflow ports, c^6 , and is screwed onto the combining cone, C C.

It will be observed that the cones, C C, C^3 , and, D C, are all connected with the casing, C' , and as this is screwed into the end of the section, c' , of the inclosing casing, C, they may be bodily removed when this becomes necessary. To this end the casing, C' , is provided interiorly at its outer end with ribs, c^{21} , for the application of a key for unscrewing the casing.

The arrangement of nozzles described is substantially that of the well known Friedman injector, but any other arrangement or set of nozzles may be used.

Within the section, c , of the inclosing casing is screwed the steam cone, S C, whose axial passage is contracted as shown at a , the volume of steam passing through the cone being controlled by a lifting cone, L C, that is enlarged about its longitudinal center, as at, a' . The lifting cone, L C, constitutes the main valve. It is movable endwise within the steam

cone, S C, and has its seat, s' , in the tubular portion, C^2 , formed within the section, c , of the inclosing casing, C, to which tubular portion the steam cone, S C, is connected.

5 The combined valve and lifting cone, L C, has ports, p , for the passage of steam thereto, and is provided with rearwardly projecting arms, a^2 , that guide the same within said tubular portion, C^2 , as the cone is moved to
10 and from its seat, s' .

Within the inner end of the lifting cone, L C, is formed a valve seat for the conical jet-valve, V^2 , that has a stop-flange, v^2 , co-acting with a sleeve, v , screwed into the inner end
15 of the lifting cone to limit the movements of said cone valve which is formed on or connected with the forward end of a valve stem, V S.

The rear end of the valve stem, V S, is secured to a forked valve shifter, V S', provided with a slotted sleeve, s^2 , through which
20 passes loosely a toothed bar, B, secured in a bearing, b , formed on section, c , of the inclosing casing, C. The forked valve-shifter, V S', also has a bearing, s^3 , for the fulcrum pin, P, of the forked shifting lever, L, in a tubular portion of which is arranged a locking
25 dog, D, secured to an operating angle lever, L', pivoted eccentrically on lever, L, and provided with the cam or inclined faces, l^3 , l^3 .
30 Within the upper tubular portion, l , of lever, L, is arranged a spring actuated follower, l^2 , that impinges upon the reverse inclines, l^3 , l^3 , of lever, L', so that when said lever is moved
35 toward lever, L, to withdraw the locking dog, D, from engagement with the teeth of bar, B, and again released, the spring-actuated follower, l^2 , will return lever, L', and locking dog, D, into their normal positions. The arm,
40 l' , of lever, L, is connected with a link or links, L^2 , pivoted to section, c , of casing, C.

The water branch, W B, opens inwardly into a valve casing V C, that has two ports, p^3 , and, p^4 , adapted to be closed by valves, V^3 ,
45 V^4 , the stem, V S², of which has at its outer end a collar, a^3 , forming an abutment for the arm, A^3 , of the valve shifter, V S', the other arm, A^2 , straddling or loosely inclosing the said valve stem, V S², and serving as a guide
50 therefor.

The operation of the injector when constructed as above described, is as follows: If the lever, L, is moved a short distance in the direction of arrow, A, the valve, V^2 , will leave
55 its seat without affecting the lifting cone, L C, steam passing from branch, S B, through ports, p , into lifting cone, L C. The steam thus injected will find a free outlet through overflow chamber O C, valve, V' , and overflow
60 branch, O B, and thus forming or producing the necessary vacuum in the water chamber, W C, water being drawn into the injector. As soon as the water commences to flow out of overflow branch, O B, the lever,
55 L, is again moved in the same direction, when the collar, v^2 , of valve, V^2 , abutting against sleeve, v , will carry the lifting cone, L C,

along, thus opening the passage to the steam cone, S C. When the lifting cone has been moved sufficiently to completely uncover the
70 steam inlet end of the steam cone, S C, the valve shifter, V S', will be in such a position as to cause the arm, A^2 , to strike the abutment, a^3 , on valve stem, V S², the position of the valves, V^3 , V^4 , being then such as to leave
75 the ports, p^3 , p^4 , fully open, admitting a full flow of water to the combining cone, C C, and simultaneously a full flow of steam to the steam cone, S C. By a further movement of the lever, L, still in the same direction the arm, A^2 ,
80 carries the valve stem, V S², and valves V^3 , V^4 , along and the ports, p^3 , p^4 , are more or less closed according to the extent the valve shifter, V S', is moved, thereby regulating the volume of water admitted.
85

It is often desirable to decrease the volume of steam admitted to the injector without correspondingly decreasing the volume of water admitted, and this may be readily done by the valve shifting mechanism described.
90

It will be readily understood that when the arm, A^2 , of valve shifter, V S', is in contact with abutment, a^3 , on valve stem, V S², the arm, A^3 , of said valve shifter will have moved
95 away from the abutment a distance nearly equal to that between the inner faces of said arms, or a distance equal to that necessary to move the lifting cone, L C, completely off its seat, s' , to fully open the steam passage to
100 cone, S C. It follows that the lifting cone, L C, may be moved toward its seat to more or less close the passage for the steam to the steam cone, S C, without in any way interfering with the water valves, V^3 , V^4 . The lever, L, in this case is of course moved in a
105 direction the reverse of that shown by arrow, A.

In injectors for locomotive or other boilers, in which the steam is kept substantially at the same pressure, it is desirable that when
110 the volume of water to be admitted is once adjusted it should not be disturbed afterward, the operation of the injector being controlled by the adjustment of the volume of steam admitted thereto.
115

A construction and arrangement of devices for the purposes last above referred to, I have shown in Fig. 2, in which the operative elements are precisely the same, though differently arranged to suit the altered conditions.
120 The valve stem, V S², passes loosely through an extension of the valve shifter, V S', that has a vertical axial bore in which is located a spring-actuated locking dog, D', provided with a transverse slot, the upper face of which
125 is inclined, as shown at, d' . A cone pin, P', guided by a screw, s^6 , that projects into a groove in said pin is adapted to pass into the transverse slot of the dog and impinging upon the inclined face, d' , thereof lifts the same
130 out of engagement with a shoulder, S^2 , formed by an attenuated portion of valve stem, V S². When the locking dog is in the position shown in Fig. 2, it performs the function of the arm,

A^2 , of the valve-shifter, $V S'$, (Fig. 1) to carry the same from left to right, while the extension, E , of valve shifter co-operating with the head or collar, a^3 , on the outer end of the valve stem, $V S^2$, carries the same in an opposite direction. It is obvious that when the valves, V^3 , V^4 , are adjusted to the desired volume of water to be admitted, and the dog, D' , is locked out of the way of shoulder, S^2 , the valve stem, $V S$, may be moved to and fro, to regulate the volume of steam admitted without disturbing the valves, V^3 , V^4 . Of course, any other mechanical device may be substituted for the lever, L , to operate the valve shifter, $V S'$.

In Fig. 3, I have shown a further modification in the valve operating devices which are, in every respect, the same as those shown in Figs. 1 and 2, except that instead of a toothed guide-bar for the valve shifter, $V S'$, I employ a revoluble screw shaft, S' , the sleeve, s^2 , of the same construction as shown in Figs. 1 and 2, said shaft, S' , being provided with a suitable hand-wheel, W . The locking dog, D , is shaped to properly engage the thread of the shaft. By means of this arrangement the valves may either be adjusted by the lever, L , or independently of said lever by the hand wheel, w , by means of which latter, a more delicate adjustment is possible, and said adjustment may be effected through the medium of the hand wheel without disengaging the locking dog from the thread of the shaft, whereby said shaft is made to serve the two fold purpose of an adjusting device as well as a locking device for the hand lever. Of course, this construction may also be applied to the valve shifting devices shown in Fig. 2.

I am aware that injectors have heretofore been proposed in which the steam and water admission valves are operated simultaneously by one and the same lever, as for instance, in the Ware system. It is well known however, that in order to obtain the greatest efficiency the valve shifting mechanism should be so constructed as that the valves may be operated independently of each other, and this object is attained by my invention.

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

1. In an injector, the combination with the steam and water admission valves, the stem of the last named valve being provided with one or more abutments, of a valve shifter rigidly connected with the stem of the steam admission valve and provided with one or more arms extending into the path of the abutment or abutments on the stem of the water admission valve for the purpose of moving the valves successively from or to their seats, for the purposes set forth.

2. In an injector, the combination with the steam and water admission valves and devices for actuating the same such as a shifting lever and connections between the same and the stems of the valves arranged and op-

erating to move the latter successively to or from their seats, and a hand lever for operating the shifting lever, of an actuating device as a revoluble screw shaft, and a pin or dog connected with the shifting lever engaging the thread of the shaft, substantially as and for the purpose set forth.

3. In an injector, the combination with the steam and water admission valves, a valve shifting mechanism comprising a shifting device and a connection between the same and the stems of the valves, said device being provided with a tubular bearing, and a screw shaft revoluble in said bearing and provided with a hand wheel, of a hand lever connected with the valve shifting device for imparting motion thereto, said hand lever having a locking dog adapted to engage the thread in the screw shaft whereby the valve shifting device may be operated independently of the hand lever, for the purpose set forth.

4. In an injector, the combination with the steam and water admission valves the stem of the last named valve being provided with one or more abutments, of a valve shifting device rigidly connected to the stem of the steam valve and provided with a longitudinally slotted guide sleeve and one or more arms extending into the path of the abutment or abutments on the stem of the water admission valve, a hand lever connected with and operating the valve shifting device, said hand lever being provided with a locking dog and a screw shaft revoluble in the slotted sleeve and adapted to be engaged by the locking dog of the hand lever, for the purpose set forth.

5. In an injector, the combination of the valve shifter provided with arms, A^2 , A^3 , the steam admission valve and its stem connected with the shifter, and the water admission valve the stem of which passes through the arm, A^2 , of said lever, said stem having an abutment interposed between said arms of the shifting lever, substantially as and for the purposes specified.

6. In an injector, the combination with the valve stems, $V S$ and $V S^2$, the latter having a collar, a^3 , the shifting device, $V S'$, connected with stem, $V S$, and having arms, A^2 , A^3 , adapted to co-operate with said collar, a^3 , said shifting device, $V S'$, having a guide sleeve, s^2 , of a guide bar extending through the sleeve and held against longitudinal motion therein, the link, L^2 , the hand lever, L , pivoted to said link and to the shifting device, $V S'$, and having a locking dog, D , adapted to enter the slot in the sleeve, s^2 , and engage the guide bar, for the purposes set forth.

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

FERDINAND BRUNBAUER.

Witnesses:

NETTIE S. HARRIS,
RUDOLF VON CLANK.