June 30, 1931. C. R. SAMPSON 1,812,559

RAILWAY CROSSING GATE

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Fig. 1.

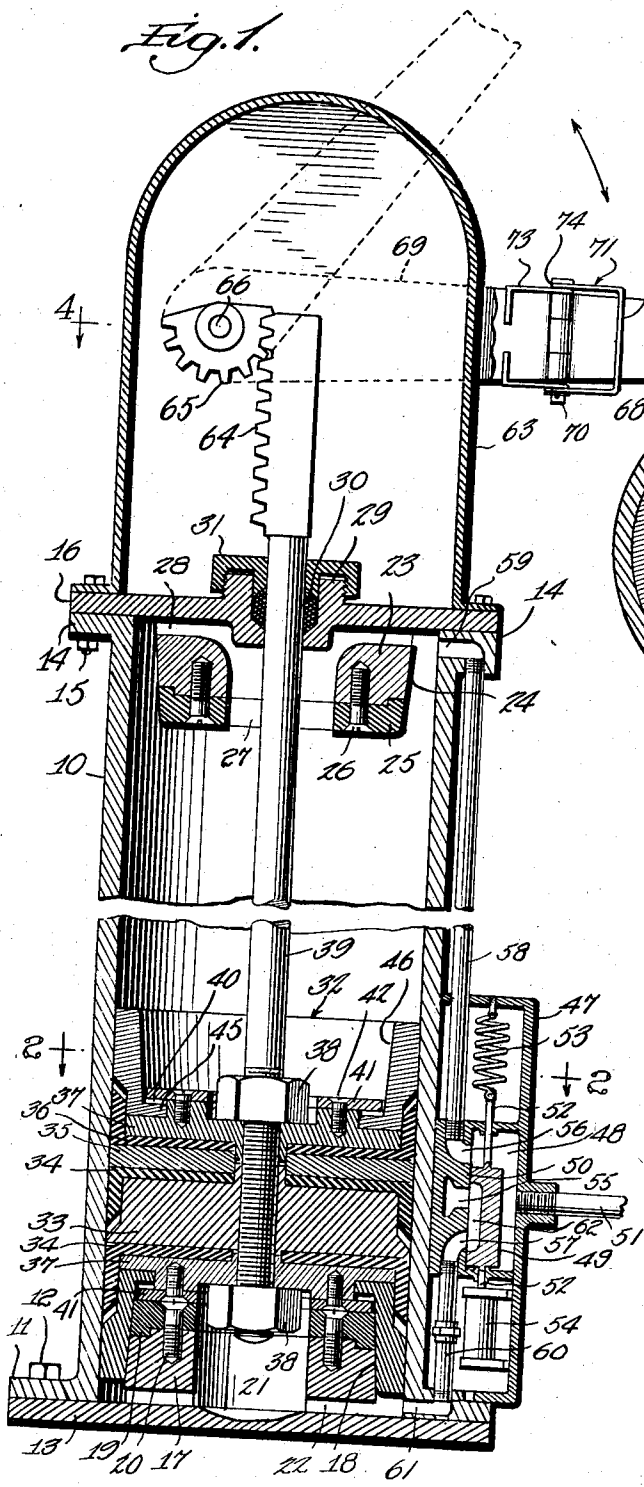
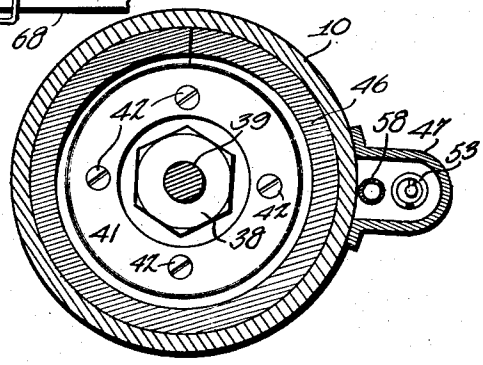


Fig. 2.



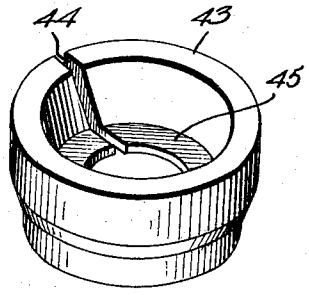


Fig. 3.

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Fig. 4.

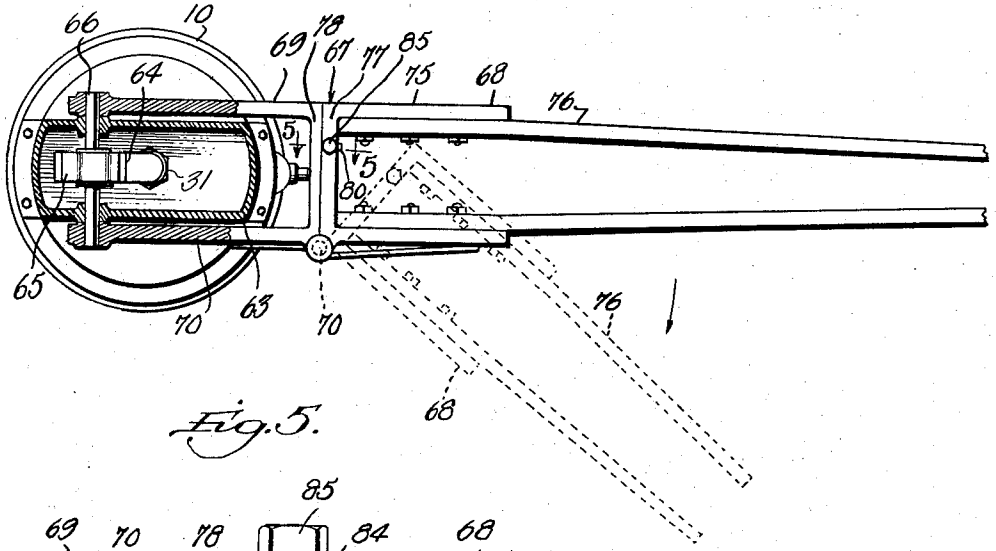


Fig. 5.

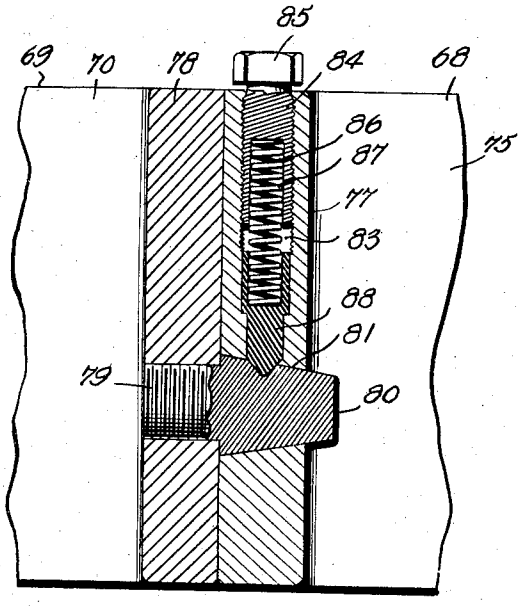
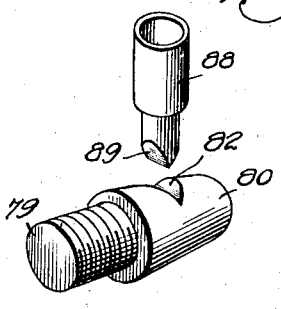


Fig. 6.



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RAILWAY CROSSING GATE

Application filed June 20, 1928. Serial No. 286,940.

This invention relates to railway crossing gates, and is a continuation in part of my copending application Serial No. 200,115, filed June 20th, 1927.

An important object of the invention is to provide pneumatically actuated means for swinging the gates to operative and inoperative positions.

A further object is to provide pneumatically operated means associated with the gate actuating means and operable for retaining the gate in either open or closed position.

A further object is to provide apparatus of the character referred to including a piston reciprocable in a cylinder, and to provide means for locking the piston in either of its positions by the use of the fluid pressure employed.

A further object is to provide an apparatus of the character referred to wherein the piston comprises a plurality of parts movable slightly relatively to each other when the piston reaches a point adjacent the ends of its strokes, the relative movement of the parts referred to being operative through the medium of the fluid pressure employed for locking the piston in either of its two positions.

A further object is to provide means for utilizing the movement of the piston as it approaches either limit of its movement for actuating the locking means upon further movement of the piston under the influence of fluid pressure within the cylinder.

A further object is to provide a gate structure which is adapted to permit vehicles to escape from between gates at the opposite sides of a crossing when the vehicle is between the gates at the time the latter are lowered.

A further object is to provide a gate structure of the character just referred to provided with a section which is laterally operable when the gate is in closed position upon the application of force thereto to permit a vehicle trapped between gates at the opposite side of a crossing to escape without injury to the gate and without material injury to the vehicle.

A further object is to provide a gate structure wherein lateral movement is accomplished only by striking a blow thereagainst whereby the gate retains its normal position against any manual force applied thereto.

A further object is to provide a railway crossing gate having a laterally movable section of the character referred to which is adapted upon release of the force used for swinging it laterally to return to normal position and to be locked in such position.

Other objects and advantages of the invention will become apparent during the course of the following description.

In the drawings I have shown one embodiment of the invention. In this showing,

Figure 1 is a central vertical sectional view through the apparatus, parts being shown in elevation and parts being broken away,

Figure 2 is a section on line 2—2 of Figure 1,

Figure 3 is a detail perspective view of a locking ring,

Figure 4 is a section on line 4—4 of Figure 1, parts being shown in elevation,

Figure 5 is an enlarged detail sectional view on line 5—5 of Figure 4, and,

Figure 6 is a detail perspective view of the latch mechanism of the swinging gate section.

Referring to Figures 1, 2 and 3, the numeral 10 designates a cylinder which is preferably vertically arranged adjacent a railway crossing. It will be apparent that two of the gates are used at opposite sides of the railway crossing, and if the road leading to the railroad tracks is sufficiently wide, similar cylinders may be arranged at opposite sides of the road. The cylinder is flanged at its lower end as at 11, and is bolted as at 12 to a lower head or base 13. The upper end of the cylinder is similarly flanged as at 14 and is adapted to be bolted as at 15 to a head 16.

The lower head 13 is provided with an axial boss 17, the outer face of which is slightly tapered as at 18 to decrease in diam-

eter toward its upper end. A wear plate 19 forms a continuation of and is secured against the top of the boss 17 by screws 20 or other fastening elements. The boss 17 and wear plate 19 are provided with a relatively large axial opening 21 which communicates with the lower extremity of the cylinder through radial passages 22.

The upper head 16 is similarly provided with a depending axial boss 23 which has its outer surface slightly tapered as at 24 to decrease in diameter toward its lower end. A wear plate 25 is secured to the boss 23 by screws 26 or other fastening elements. The boss 23 and wear plate 25 are provided with an axial opening 27 which communicates with the interior of the upper end of the cylinder through radial passages 28. A packing gland 29 is carried by the head 16, this gland being provided with packing 30 adapted to be compressed by a threaded cap 31.

A piston indicated as a whole by the numeral 32 is adapted to reciprocate in the cylinder. This piston includes a plate 33 having packing washers 34 arranged against opposite sides thereof. A disk 35 is arranged against the upper packing washer, and above this plate a third washer 36 is arranged, the flange of the latter packing being turned upwardly as clearly shown in Figure 1. Plates 37 are arranged against the upper and lower packing washers, and these plates are engaged by nuts 38 threaded on the lower end of a piston rod 39. It will be apparent that the nuts 38 are adapted to clamp together the elements of the piston just described.

The upper and lower plates 37 are provided in their top and bottom faces respectively with annular grooves 40, and plates 41 are secured against the faces of the plates 37 referred to by screws or the like 42. Locking rings 43 are arranged at each end of the cylinder and are split as at 44 to permit circumferential expansion and contraction. Each locking ring is provided with an internal annular flange 45 arranged in the grooves 40 and retained in position by the plates 41. The thickness of each flange 45 is less than the height of the corresponding groove 40 whereby each locking ring is adapted to partake of limited vertical movement relative to the body of the piston. The outer surface of each locking ring is slidable against the interior of the cylinder, while the inner face of each locking ring is slightly tapered as at 46 for engagement with the bosses 17 and 23.

A casing 47 is arranged against one side of the cylinder as shown in Figure 1. This casing includes a valve chamber 48 in which is arranged a valve 49 slidable against a seat 50. Fluid pressure is communicated to the chamber 48 through a pipe 51 connected to a suitable source of fluid pressure such as compressed air. The valve is provided at its upper and lower ends with stems 52 slidable in the upper and lower walls of the chamber 48. A spring 53 normally retains the valve in its upper position, being connected to the upper stem 52 as shown in Figure 1. The lower stem 52 constitutes the armature of a solenoid 54 which is adapted to be actuated to move the valve to its lower position.

The valve seat is provided with a central port 55 which communicates with the atmosphere through the side of the casing 47, and upper and lower ports 56 and 57. The upper port 56 communicates with the lower end of a pipe 58, the upper end of which is threaded into the flange 14 to deliver fluid pressure to the upper end of the cylinder through a port 59. Similarly the lower port 57 communicates with the upper end of a pipe 60 which is threaded into the flange 11 to deliver fluid pressure into the bottom of the cylinder through a port 61. The valve 49 is provided with a port 62 which is adapted to afford communication between the exhaust port 55 and either of the ports 56 or 57.

The upper end of the cylinder is provided with a cover 63 which may be secured to the head 16 by the bolts 15. Within the cover 63 the upper end of the piston rod 39 is provided with a rack 64 meshing with a segment gear 65 mounted upon a shaft 66. As shown in Figure 4, the shaft 66 is journalled in opposite sides of the cover 63. A crossing gate indicated as a whole by the numeral 67 is adapted to be actuated by the shaft 66. As shown, the gate includes an outer section 68 and an inner section 69 which includes spaced parallel arms 70 secured to the extremities of the shaft 66 to turn therewith. It will be apparent that as the piston rod is reciprocated, the gate 67 will be moved between substantially horizontal and vertical positions.

As stated, the gate 67 comprises inner and outer sections 68 and 69, and these sections are hinged together by a pivot pin 70 mounted at the outer side of the gate. Thus the section 68 of the gate is adapted to move outwardly as suggested by the dotted lines in Figure 4. A spring 71 is provided with an outer portion 72 bearing against the gate section 68 and an inner section 73 bearing against the gate section 69, the spring being provided with a central portion 74 coiled about the pivot pin 70. The gate section 68 includes a substantially U-shaped portion 75 against the inner faces of the sides of which are secured gate arms 76 of the usual construction. The gate arms 76 may be of any desired length according to the width of the roadway, and if desired, separate gates may be arranged at opposite sides of

the road when the latter is relatively wide. Similarly one or a pair of gates may be arranged at the opposite sides of the railway tracks, and the movable sections of the gates swing away from the tracks as will become apparent.

The base portion 77 of the U-shaped member 75 normally fits flat against a transverse member 78 connecting the arms 70. A stud 79 is threaded in the member 78, as clearly shown in Figure 5, and is provided with a tapered head 80 normally projecting through a similarly shaped opening 81 formed in the member 77. The head 80 of the stud is provided with a preferably V-shaped groove 82 for a purpose to be described.

The member 77 is provided with a vertical opening 83 the upper end of which is threaded to receive a plug 84 having a head 85 at its upper end. The inner end of the plug 84 is provided with an axial opening 86 to receive a spring 87. This spring projects downwardly into an opening formed in a latch member 88 slidable in the lower end of the opening 83. The latch member is provided with a substantially V-shaped lower end 89 adapted to be received in the groove 82, as shown in Figures 5 and 6. It will be apparent that the tension of the spring 87 may be adjusted by turning the plug 84 upwardly or downwardly.

The operation of the apparatus is as follows:

Energization of the solenoid 54 is preferably controlled by a train control system whereby it will be energized when a train approaches the crossing. Normally, the solenoid is deenergized, and the valve 49 is held in its upper position by the spring 53, under which conditions, fluid under pressure will be supplied to the bottom of the cylinder through chamber 48, port 57, pipe 60, port 61, passage 22 and axial opening 21, and thus the piston will be held at the top of the cylinder to normally retain the gate in vertical position.

When the solenoid is energized upon the approach of a train, it exerts a sufficient pull upon the valve 49 to overcome the tension of the spring 53, and the valve will move to its lower position. Under such conditions, fluid pressure from the chamber 48 will be communicated to the top of the cylinder through the port 56, pipe 58, port 59, passage 28 and opening 27. Thus the piston will be moved to its lower position, and the rack 64, meshing with the pinion 65, will swing the gate downwardly to horizontal position. It will be apparent that the pipe 58 communicates with the exhaust port 55 through valve port 62 when the piston is in its upper position, while the lower end of the cylinder will be communicated to the atmosphere in a similar manner when the valve is in its lower position.

It will be apparent that any suitable source of fluid pressure may be employed for operating the device, and pressure is constantly present in the chamber 48 to retain the piston either in upper or lower position. Means is provided for positively locking the piston in either position to prevent unauthorized manual movement of the gate. As the piston approaches the lower end of its stroke, the lower locking ring will contact with the boss 17. The contacting faces of these elements are tapered as described, and continued downward movement of the piston moves the upper end of the lower locking element into contact with the lower plate 37 whereupon the tapered contacting faces referred to cause circumferential expansion of the lower locking member whereby the latter tightly grips against the inner face of the cylinder. The locking member also contacts with the flange of the lower packing washer 34 to expand this member into tight gripping engagement with the cylinder.

Thus, the presence of fluid pressure in the upper end of the cylinder 10 effectively retains the piston locked in lower position to prevent anyone from manually elevating the gate. A similar locking action takes place at the upper end of the cylinder, the tapered surface 24 of the bosses 23 contacting with the upper locking ring to expand the latter, and the flange of the packing washer 36, into locking engagement with the cylinder. Thus it will be apparent that the fluid pressure is utilized not only for moving the piston but for locking it in either position.

Assuming the piston to be in the position shown in Figure 1, and that a train has just passed beyond the crossing, the solenoid will be deenergized to permit the spring 53 to shift the valve 49 to the upper position, it will be apparent that fluid pressure will be admitted into the bottom of the cylinder. This pressure acts against the lower end of the locking ring tending to move the latter upwardly, but it usually occurs that the locking member so tightly grips against the cylinder and the lower boss 17, that the pressure is insufficient to release the locking member by forcing it upwardly. Under such conditions, fluid pressure acts against the bottom of the piston through the passages 22 and opening 21, and thus the piston will start to move upwardly by virtue of the play between the internal flange of the lower locking member and the plate 41.

Thus it will be apparent that initial movement of the piston will not be impeded by the lower locking ring, and hence the piston will move upwardly, whereupon the plate 41 will strike against the internal flange of the locking member to dislodge the locking member from locking position. Since the locking member is resilient, it contracts to normal position as soon as it starts it up-

ward movement and accordingly the piston is adapted to continue its upward movement until it reaches the top of the cylinder.

When the upper locking member contacts with the tapered face of the boss 23, the air pressure in the bottom of the cylinder causes the ring to expand in the manner referred to, and the continued application of pressure to the bottom of the cylinder retains the piston in locked position at the top of the cylinder. Upon the approach of a train, the solenoid 54 will be energized to move the valve 49 downwardly whereupon fluid pressure will be exhausted from the bottom of the cylinder and will be supplied to the top thereof. The lock releasing action previously described also takes place under such conditions. The piston will move downwardly until the upper plate 41 contacts with the flange 45 of the upper locking member, whereupon the locking member will be released. The provision of the locking means is important, since it effectually holds the gate in either position when leakage takes place past the piston or valve mechanism. Thus the operation of the apparatus is positive, and the gate is retained in either of its two positions against unauthorized manual movement.

The operation of the parts preferably takes place automatically in the manner referred to through its connection with a suitable train control system. Under such conditions, it occasionally will happen that a vehicle will be trapped between the gates and it is desired to permit such a vehicle to escape from the crossing without damage to the gates, and without material damage to the vehicle. Assuming that the vehicle is trapped between the gates at opposite sides of a crossing, the vehicle may proceed across the tracks until it strikes the movable section of the gate. The blow struck by the vehicle swings the movable section of the gate about its pivot, thus dislodging the latch 88 from the groove 82, whereupon the gate is freely movable to open position, the tension of the spring 71 being relatively slight. After the vehicle has passed beyond the gate, the spring 71 swings the gate to closed position, and the tapered end 89 of the latch slides upwardly upon the tapered head of the boss until it snaps into position within the groove 82 The spring 71 is intended to exert only sufficient force to swing the gate to closed position, but the spring 87 preferably is sufficiently strong to prevent manual movement of the gate. Thus the latter is, in effect, formed of a single section, but the movable section is adapted to swing outwardly away from the tracks when a fairly sharp blow is struck thereagainst.

It is to be understood that the form of the invention herewith shown and described is to be taken as a preferred example of the same and that various changes in the shape, size and arrangement of parts may be resorted to without departing from the spirit of the invention or the scope of the subjoined claims.

I claim:

1. A device of the character described comprising a pressure chamber, a member mounted in said chamber and movable by differential pressure on opposite sides thereof, a gate operatively connected to said member to be moved thereby to operative and inoperative positions, and means in said chamber actuated by pressure therein for locking said gate in either position.

2. A device of the character described comprising a gate, a cylinder, a piston mounted to reciprocate in said cylinder and to contact with portions thereof at each end of its stroke, connections between said cylinder and said gate, and means operative under the influence of fluid pressure in said cylinder and upon contact between said piston and said portions of the cylinder for locking the piston at either end of its stroke.

3. A device of the character described comprising a gate, a cylinder, a piston mounted to reciprocate in said cylinder, connections between said cylinder and said gate, means for introducing fluid pressure into either end of said cylinder, and means in said cylinder controlled by fluid pressure therein for locking said piston against movement when it reaches either end of said cylinder.

4. A device of the character described comprising a gate, a cylinder, a piston mounted to reciprocate in said cylinder, connections between said cylinder and said gate, means for introducing fluid pressure into either end of said cylinder, a lock carried by said piston and adapted to engage said cylinder, and means controlled by fluid pressure for actuating said lock when said piston reaches either end of said cylinder.

5. A device of the character described comprising a gate, a cylinder, a piston mounted to reciprocate in said cylinder, connections between said piston and said gate, means for introducing fluid pressure into either end of said cylinder, and a lock carried by said piston and adapted to be actuated by fluid pressure to cause it to engage said cylinder when said piston reaches either end of said cylinder.

6. A device of the character described comprising a gate, a cylinder, a pair of relatively movable members constituting a piston reciprocable in said cylinder and operable by fluid pressure to move said gate to operative and inoperative positions, and means operable under the influence of fluid pressure in said cylinder and by relative movement between said members when said gate reaches either of its positions for locking said piston against movement.

7. A device of the character described comprising a gate, a cylinder, a piston reciprocable in said cylinder and operatively connected to said gate, and a locking member carried by said piston and radially movable into engagement with the walls of said cylinder to lock said piston against movement, and means carried by said cylinder and adapted to contact with and actuate said locking member upon movement of said piston under the influence of fluid pressure in said cylinder to a point adjacent one end of its stroke.

8. A device constructed in accordance with claim 7 wherein said locking member comprises a split ring adapted to be circumferentially expanded to effect locking movement thereof upon contact with said means.

9. A device constructed in accordance with claim 7 wherein said locking member comprises a split ring, said ring and said means having coacting tapered faces adapted to contact with each other to effect locking movement of said ring.

10. A device of the character described comprising a gate, a cylinder, a piston reciprocable in said cylinder and operatively connected to said gate, a locking member carried by said piston and adapted to partake of limited axial movement with respect thereto, means carried by said cylinder and adapted to contact with and actuate said locking member upon movement of said piston under the influence of fluid pressure in said cylinder to a point adjacent one end of its stroke, and means for introducing fluid pressure into either end of the cylinder and exhausting pressure from the opposite end thereof, said piston and said locking member being both subjected to pressure within the cylinder.

11. A device of the character described comprising a gate, a cylinder, a piston reciprocable in said cylinder and operatively connected to said gate, a split locking ring carried by said piston and having a tapered inner face, a member carried by said cylinder in one end thereof and having a tapered outer face adapted to contact with the tapered face of said ring to effect circumferential expansion thereof into locking engagement with the walls of the cylinder when said piston is moved to said end of the cylinder under the influence of fluid pressure therein, and means for introducing fluid pressure into either end of said cylinder and exhausting pressure from the opposite end thereof.

12. A device constructed in accordance with claim 11 wherein said locking ring is adapted to partake of limited axial movement with respect to said piston.

In testimony whereof I affix my signature.

CHARLES R. SAMPSON.