

April 7, 1931.

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1,799,463

HYPODERMIC SYRINGE

Filed March 19, 1926

2 Sheets-Sheet 1

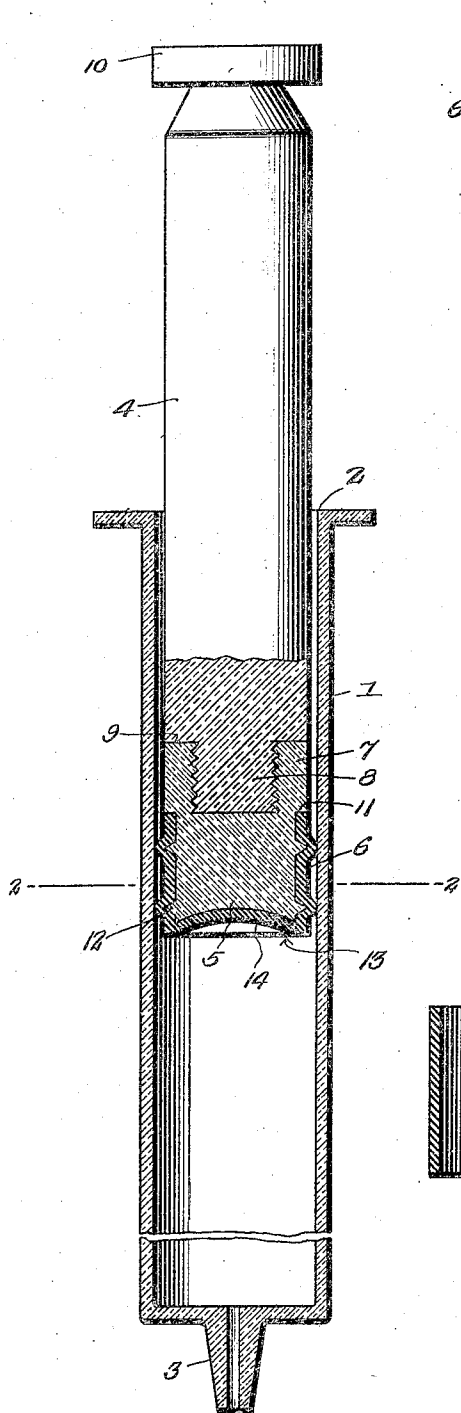


Fig. 1.

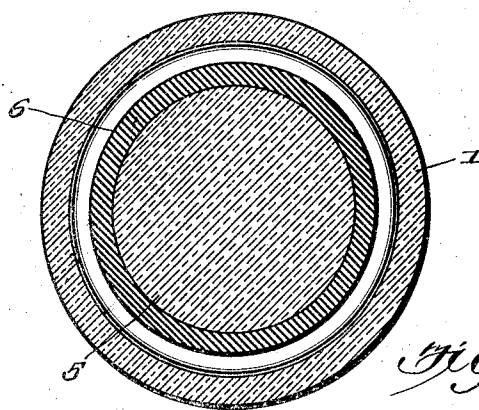


Fig. 2.

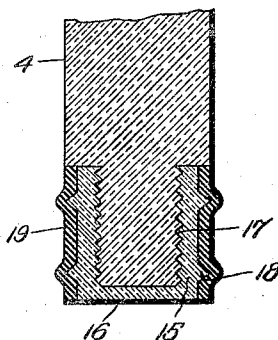


Fig. 3.

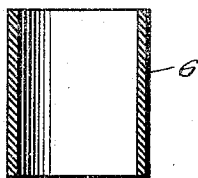


Fig. 4.

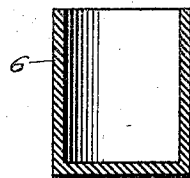


Fig. 5.

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2 Sheets-Sheet 2

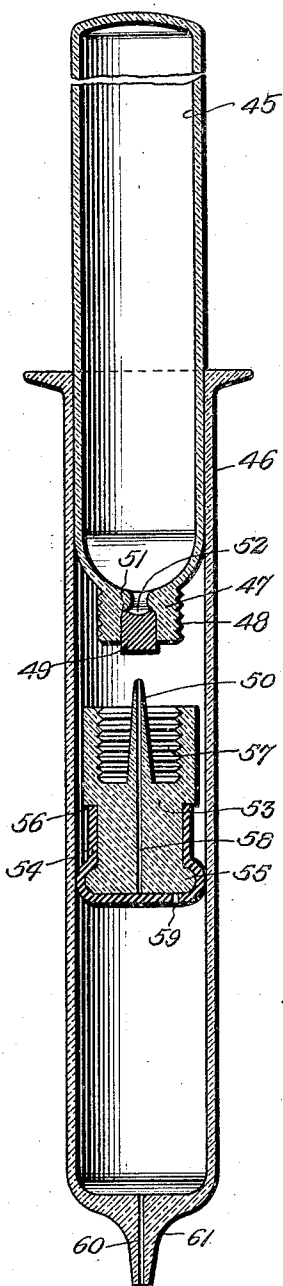


Fig. 9.

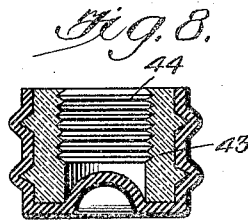


Fig. 8.

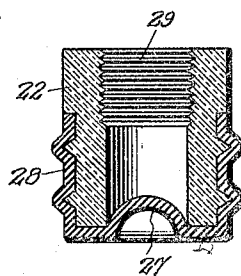


Fig. 7.

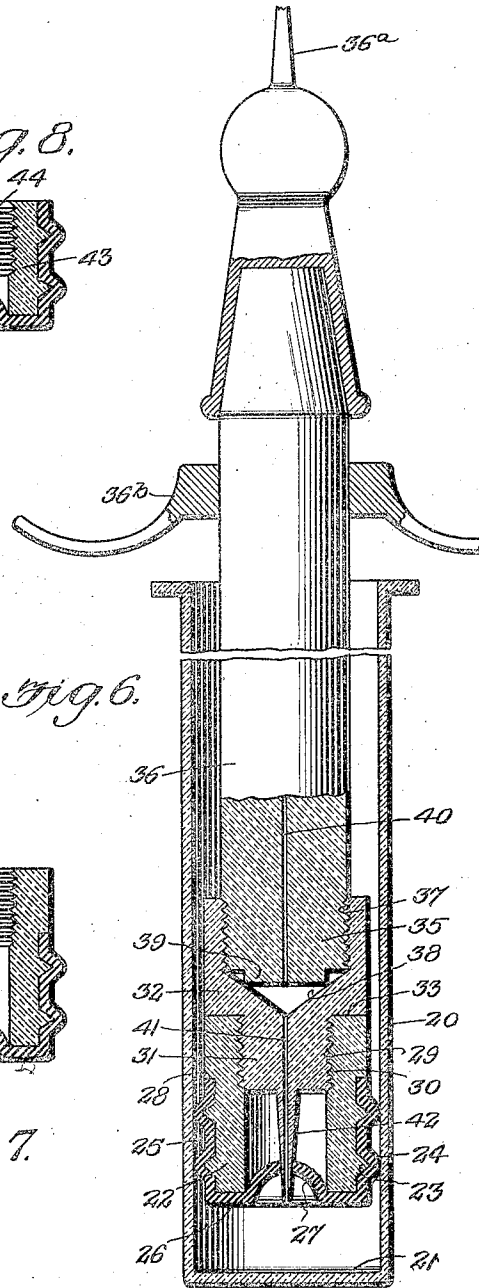


Fig. 6.

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HYPODERMIC SYRINGE

Application filed March 19, 1926. Serial No. 96,015.

The invention relates to piston construction for hypodermic syringes.

The object of the invention is to provide simple, practical and efficient piston head construction of strong, durable and comparatively inexpensive construction designed to be constructed of elastic or solid material or of both and adapted to function as a stopper closure for containers such as conventional syringe barrels of hypodermic syringes and capable when it becomes stuck to the walls of a container by long standing of being readily released from its seat and of being easily operated to withdraw it from or reciprocate it within the container for discharging all or a portion of the contents thereof and adapted also after such an operation to be left in the container as a stopper closure as well as for operation for use as a piston for successive operations where portions of the contents of the container are to be used at intervals.

Another object of the invention is to reduce to a minimum lateral expansion of the piston head when force is applied in operating the same and by avoiding such lateral expansion to prevent the possibility of breaking the more fragile containers and the sticking or excessive frictional resistance to the movement of the piston in stronger containers of the metal or pyrex type. This object is accomplished by constructing the piston of solid material ground to fit its container snugly and at the same time be readily movable therein or by constructing the piston head of materials of different density or degrees of hardness, one material being elastic and the other being partially elastic or non-elastic and serving as a core for the elastic material, the core being constructed to present to the walls of the container a minimum amount of the elastic material and thereby produce the least possible frictional contact between the piston and the walls of the container consistent with the functioning of the elastic material as a perfect packing.

A further object of the invention is to provide means for readily connecting a detachable piston rod with the piston head to

enable the latter to be reciprocated in the container and also to be readily rotated axially therein by the piston to free the piston head in case of the sticking of the latter to the walls of the container.

A further object of the invention is to provide a piston head of this character adapted for use in connection with a solid piston rod or operating member and also to enable the piston head to be operatively connected with a hollow piston rod or operating member adapted to contain a medicant or other solution capable of being automatically released by the puncturing of a stopper closure of the hollow piston rod when the same is operated to connect it with the piston head.

With these and other objects in view, the invention consists in the construction and novel combination and arrangement of parts hereinafter fully described, illustrated in the accompanying drawings and pointed out in the claims hereto appended, it being understood that various changes in the form, proportion and minor details of construction, within the scope of the claims, may be resorted to without departing from the spirit or sacrificing any of the advantages of the invention.

In the drawings:

Figure 1 is a longitudinal sectional view of a hypodermic syringe piston constructed in accordance with this invention.

Fig. 2 is a horizontal sectional view of the same on the line 2—2 of Fig. 1.

Fig. 3 is a vertical sectional view of a portion of a piston illustrating another construction for detachably connecting the piston head with the piston rod.

Fig. 4 is a detail view of a cylindrical elastic packing.

Fig. 5 is a detail view of a cylindrical packing in the form of a cap covering or closing the end of the piston head.

Fig. 6 is a vertical sectional view of a form of the invention in which the piston head operates within a container consisting of an ampule.

Fig. 7 is a detail sectional view of the piston head showing the elastic packing before the same is punctured.

Fig. 8 is a detail sectional view showing another form of piston head.

Fig. 9 is a vertical longitudinal sectional view of another form of the invention in which the piston rod or operating member is in the form of an ampule.

Referring particularly to Figs. 1 and 2 of the drawings 1 designates a container which is in the form of a conventional hypodermic syringe barrel open at one end at 2 for the insertion of the piston and provided at the other end with a nipple 3 which is designed to be connected with the needle of the hypodermic syringe in the usual manner. As the particular construction of the means for connecting the nipple with the needle of the hypodermic syringe does not constitute a portion of the present invention illustration thereof is deemed unnecessary. In the form of the invention illustrated in Figs. 1 and 2 the piston consists of a solid piston rod or operating member 4 and a piston head composed of an inner inelastic core 5 and an elastic packing 6 which is arranged on the lower or outer portion of the core and which is preferably in the form of a cap. The core 5 has a solid lower packing receiving portion and it is provided with an upper hollow interiorly threaded sleeve or portion 7 into which screws a reduced threaded shank or stem 8 of the piston rod 4. The lower end of the piston rod is reduced to form the shank or stem 8 and the latter is threaded to provide the threaded connection 8 between the piston rod and the piston head. The piston rod is provided at the upper end of the shank or stem with an annular shoulder 9 which abuts against the upper end of the hollow portion or sleeve 7 of the piston head and the piston rod is adapted to be readily screwed into and out of the threaded socket or opening formed by the hollow portion or sleeve 7 of the core 5 of the piston head. This provides for a ready attachment or connection of the piston rod with the piston head and also enables the piston rod to axially rotate the piston head to free the latter from the walls of the container 1 should the piston head by reason of long standing stick to the same. The upper end of the piston rod is shaped to form a handle 10 which is preferably in the form of a flat cylindrical portion or disk with the adjacent portion of the piston rod reduced and tapered as shown but any other suitable form of grip or handle may of course, be employed.

The elastic packing or section of the piston head preferably covers the lower solid portion of the core 5 and the said lower solid portion of the core is preferably reduced in diameter to form a horizontal shoulder 11 against which fits the upper edge of the elastic packing. The solid packing receiving portion of the core is provided with one or more annular ribs 12 extending entirely

around the core and adapted to cause the elastic packing to form annular projecting ribs or portions which bear against and frictionally engage the walls of the container 1 to form a liquid and air tight packing and a perfect packing engagement between the piston head and the walls of the container. The annular ribs 12 are preferably substantially triangular in cross section and they are adapted to present to the walls of the container a minimum amount of the elastic packing material consistent with the production of a perfect packing or joint between the piston head and the walls of the container. This will reduce to a minimum the frictional resistance of the packing to the relative longitudinal movement of the piston and the container and insure perfect ease and accuracy in the operation of the hypodermic syringe. The transverse end portion 13 of the piston packing may be provided with a concave end face 14 as illustrated in Fig. 1 of the drawings or the end face may be of uniform diameter throughout its entire area as illustrated in Fig. 5 of the drawings. Also as shown in Fig. 4 of the drawings the elastic packing may be cylindrical with the outer end or closure omitted.

The piston head is adapted to function as a stopper closure for the container as well as a piston head for expelling the contents of the container therefrom and when desired the piston rod or operating member may be unscrewed from the piston head and the latter will remain in frictional contact with the walls of the container and provide an efficient closure for the same. The container may be in the form of the conventional barrel 1 shown in Fig. 1 of the drawings or it may consist of an ampule or other container and the elasticity of the projecting annular ribs of the packing will amply compensate for any irregularities in the manufacture of such containers. By utilizing the detachable piston head as a stopper closure for a container of this character the contents of such container may be successfully used to advantage and the piston rod may be disconnected from the piston head after each operation and readily connected with the piston head for the next operation when required and the positive axial rotation of the piston head by the piston rod will readily free the piston head from the walls of the container should any sticking of the piston head within the container interfere with the free longitudinal movement of the piston head therein.

In Fig. 3 of the drawings is illustrated another form of piston head for use in connection with a solid piston rod of the character illustrated in Fig. 1. In the form of the invention shown in Fig. 3 the core 15 which may be constructed of glass or any other suitable material similar to the core 5 consists of a cylindrical body closed at the outer end

16 and provided with interior screw threads 17 to be engaged by the threads of the reduced shank or stem 8 of the piston rod 1. The upper edge of the cylindrical core 15 fits against the shoulder 9 of the piston rod and the said core 15 is provided with one or more exterior annular ribs 18 which are adapted to engage and cause annular protuberances to be formed exteriorly of an elastic packing 19 which is shown open at the lower end and which has its upper end abutting against the shoulder 9 of the piston rod 1. The piston head illustrated in Fig. 3 of the drawings is adapted to function similar to the piston head shown in Figs. 1 and 2 in forming a closure for a receptacle and in operating as a piston head for expelling the contents of the container or for sucking liquid into the same.

In Figs. 6 and 7 of the drawings is illustrated a form of the invention in which the piston head is arranged within a container consisting of an ampule 20 having a closed lower end 21. The piston head consists of a cylindrical core 22 constructed of glass or other suitable material and open at each end and provided at its lower portion with exterior annular ribs 23 adapted to cause exterior annular protuberances or ribs 24 exteriorly of an elastic packing 25. The elastic packing is in the form of a substantially cylindrical cap provided with an outer transverse portion 26 having a central approximately semi-spherical portion 27 projecting inwardly into the outer end of the cylindrical core and forming a concavo-convex closure for the same. The lower packing receiving portion of the core is exteriorly reduced to form a horizontal annular shoulder 28 located at an intermediate point between the upper and lower end of the core and providing an abutment for the upper edge of the elastic packing 25 which also abuts against the lower edge of the core. The upper portion of the core is provided with interior screw threads 29 for engaging exterior screw threads 30 of a reduced lower portion or shank 31 of a coupling section 32 constructed of glass or other suitable material. The coupling section forms an upper member of the piston head and the shoulder 33 formed by reducing the coupling member or section 32 to form a shank 30 provides an abutment for the upper edge of the cylindrical core.

The coupling member has a body portion of the same diameter as the adjacent end of the core and the said body portion is hollow and open at the upper end to provide a socket for the lower threaded end 35 of a piston 36, and it is interiorly threaded at 37 to engage the said threaded end 35. The bottom 38 of the socket is tapered or conical and the lower extremity of the piston is reduced to provide a cylindrical projection 39 which is adapted to abut against the inclined walls of the bottom of the socket of the

coupling section or member 32 of the piston head. The piston 36 is provided with a central longitudinal bore 40 and the coupling section is provided with a central longitudinal bore 41 located below and arranged in alignment with the bore 40 of the piston and extending through a puncturing needle or point 42 depending from the coupling section 32 and tapered downwardly as shown and adapted when the coupling section is screwed into the upper threaded end of the cylindrical core to pierce or puncture the concavo-convex center of the transverse portion of the elastic packing and establish a communication between the bore or passage 41 and the interior of the ampule 20. The bores 40 and 41 form passages for the liquid contents of the ampule and the piston rod or member 36 is operable to reciprocate the piston head and also to rotate the same axially to free the piston head in case of the same sticking in the ampule. The bore 40 of the piston is designed to communicate with a hypodermic needle 36A carried by the upper end of the piston which will also be provided with a suitable grip 36B. The piston head is adapted to function as a stopper closure and will provide an air and liquid tight connection until the transverse portion of the packing is punctured by the tapered needle of the coupling member. The tapered needle is formed integral with the lower portion of the coupling member and depends centrally from the same as shown.

In Fig. 8 of the drawings is illustrated a slight modification of the core illustrated in Figs. 6 and 7 of the drawings. In Figs. 6 and 7 the lower portion of the core has a smooth interior and the upper portion is threaded for engaging the coupling member while in Fig. 8 of the drawings, the core 43 is shortened and is threaded interiorly at 44 substantially throughout its entire length. The core shown in Fig. 8 is otherwise substantially the same as that illustrated in Figs. 6 and 7 and the operation is similar to that heretofore described.

In Fig. 9 of the drawings is illustrated a form of the invention in which the piston rod or operating member is in the form of an ampule 45 constructed of glass or other suitable material and arranged in an inverted position within a container 46 and provided at its lower end with a neck 47 exteriorly threaded at 48 and receiving a stopper closure 49 adapted to be punctured by a needle or puncturing point 50 of the piston head. The neck is provided with an interior seat 51 for the stopper 49 and the latter may be constructed of any suitable material and is preferably provided at its inner end with a recess 52 reducing the longitudinal thickness of the stopper at the center thereof and facilitating the piercing of the stopper by the puncturing needle 50

of the piston head. The receptacle 46 is in the form of a conventional hypodermic syringe barrel and the hollow piston rod fits snugly within and is guided by the walls of the container but has free longitudinal movement within the same.

The piston head comprises a core 53 constructed of glass or other suitable material and consisting of a solid lower portion and a hollow upper portion or sleeve. The solid lower portion which receives an elastic packing 54 is provided at its lower end with an annular rib for producing in the elastic packing an exterior annular rib 55 or protuberance for frictionally engaging the walls of the container 46 but any number of ribs of course may be provided to secure the desired frictional engagement of the packing with the walls of the container. The elastic packing is in the form of a cap and is provided with a transverse end portion which extends over the lower end of the packing receiving portion of the core. The lower packing receiving portion of the core is reduced in diameter to provide an intermediate horizontal shoulder 56 against which the upper edge of the packing abuts. The hollow upper portion of the core provides a socket to receive the neck 47 which forms a shank for the operating member or piston rod and the said core is interiorly threaded at 57 to engage the threads 48 of the neck or shank portion of the operating member or piston rod. The core is provided at its hollow upper portion with the puncturing needle or point 50 which is formed integral with the core and which depends upwardly. The puncturing needle which is centrally arranged is provided with a longitudinal bore forming a continuation of the bore 58 and providing a passage for the liquid contents of the ampule which constitutes the operating member or piston rod.

The elastic cap is provided with a valve formed by a perforation 59 arranged eccentrically of the transverse portion of the elastic packing. When the passage 60 through the nipple 61 of the hypodermic piston barrel 46 is closed and the piston is moved upwardly or outwardly the suction will cause the elastic portion of the packing to move away from the lower end of the core 53 and the liquid contents of the ampule will flow downwardly through the passage 58 and through the perforation 59 into the container 46 and a downward movement of the piston will expel the liquid contents of the barrel 46 therefrom. The ampule 45 which constitutes the operating member or piston rod is adapted to be readily connected with and disconnected from the piston head in the same manner as the piston rods or operating members heretofore described.

What I claim is:

1. A hypodermic syringe including a con-

tainer, a piston rod, a threaded coupling portion carried by the piston rod and a piston head arranged in the container and forming a stopper closure for the same and comprising a core having a threaded socket receiving and detachably engaging the said threaded coupling portion, and an elastic packing consisting of a sleeve of substantially uniform thickness throughout extending upwardly from the lower end of the core and encasing the lower portion of said core and contacting with the walls of the container.

2. A hypodermic syringe including a container, a piston rod, a threaded coupling portion carried by the piston rod and a piston head arranged in the container and forming a stopper closure for the same and comprising a core having a threaded socket receiving and engaging the said threaded portion, said core being also provided with an exterior annular rib, and an elastic packing arranged on the core and having an annular protuberance formed by the said rib and contacting with the walls of the container.

3. A hypodermic syringe including a container, a piston rod, a piston head arranged within the container and comprising a core, an elastic packing arranged on the core and forming a closure for the core and a puncturing point or needle carried by the piston and arranged to puncture the closure of the sleeve.

4. A hypodermic syringe including a container, a piston rod, a piston head arranged within the container and forming a stopper closure for the same and comprising a core, said core and piston rod having cooperating means for detachably connecting the piston rod with the piston head, an elastic packing consisting of a cap fitted on the core and having a transverse portion extending across the end of the same and a puncturing point or needle carried by the piston and arranged to puncture the transverse portion of the elastic packing when the piston rod is connected with the piston head.

5. A hypodermic syringe including a container, a piston rod, a piston head arranged within the container and forming a stopper closure for the same and comprising a core, said core and piston rod having cooperating means for detachably connecting the piston rod with the piston head, an elastic packing arranged on the core and consisting of a cap having a transverse portion extending across the end of the sleeve and projecting into the same and a puncturing point or needle carried by the piston rod and arranged to pierce the projecting portion of the elastic packing.

6. A hypodermic syringe including a container, a piston rod, a piston head arranged within the container and forming a stopper closure for the same and comprising a core, said core and piston rod having cooperating means for detachably connecting the piston

rod with the piston head, an elastic packing consisting of a cap arranged on the core and having a substantially concavo-convex portion projecting into the said core and a
5 tapering puncturing needle or point carried by the piston rod and arranged to pierce the concavo-convex portion of the elastic packing.

7. A hypodermic syringe including a container, a piston rod having a threaded portion and provided with a bore, a coupling member having interiorly and exteriorly threaded portions the interiorly threaded portion receiving the threaded portion of
10 the piston rod, said coupling member being also provided with a bore and having a hollow puncturing needle communicating with the bore of the coupling member and a piston head consisting of a sleeve interiorly threaded
15 to receive the threaded portion of the coupling member and an elastic packing consisting of a cap fitted on the sleeve and having a transverse portion extending across the end of the same and arranged to be punctured by the said needle or point.
20
25

8. A hypodermic syringe including a container, a piston rod having a bore and provided with a lower threaded end having a reduced terminal projecting portion, a coupling member having interiorly and exteriorly threaded portions, the interiorly threaded portion receiving the threaded portion of the
30 piston rod, said interiorly threaded portion having a substantially conical bottom with which the said reduced portion contacts, said coupling member being also provided with a bore and having a hollow puncturing needle communicating with the said bore of the coupling member and a piston head comprising a sleeve interiorly threaded to receive the threaded portion of the coupling member
35 and an elastic packing consisting of a cap fitted on the sleeve and arranged to be punctured by the needle when the coupling member is connected with the piston head.
40
45

9. A syringe including a cylindrical container, a combination piston rod and container, a piston head arranged within the cylinder container and forming a stopper closure
50 for the same, said combination piston rod and container having cooperating means for detachably and rigidly connecting the combination piston rod and container with the piston head, one of said parts having a projecting puncturing needle and the other part
55 being provided with a portion adapted to be punctured by the projecting puncturing needle.

60 In testimony whereof I have hereunto set my hand.

GEORGE N. HEIN.