(No Model.) 4 Sheets—Sheet 1.

C. W. NASON.

MACHINE FOR INSERTING DIAPHRAGMS IN RADIATOR TUBES.

No. 362,103. Patented May 3, 1887.

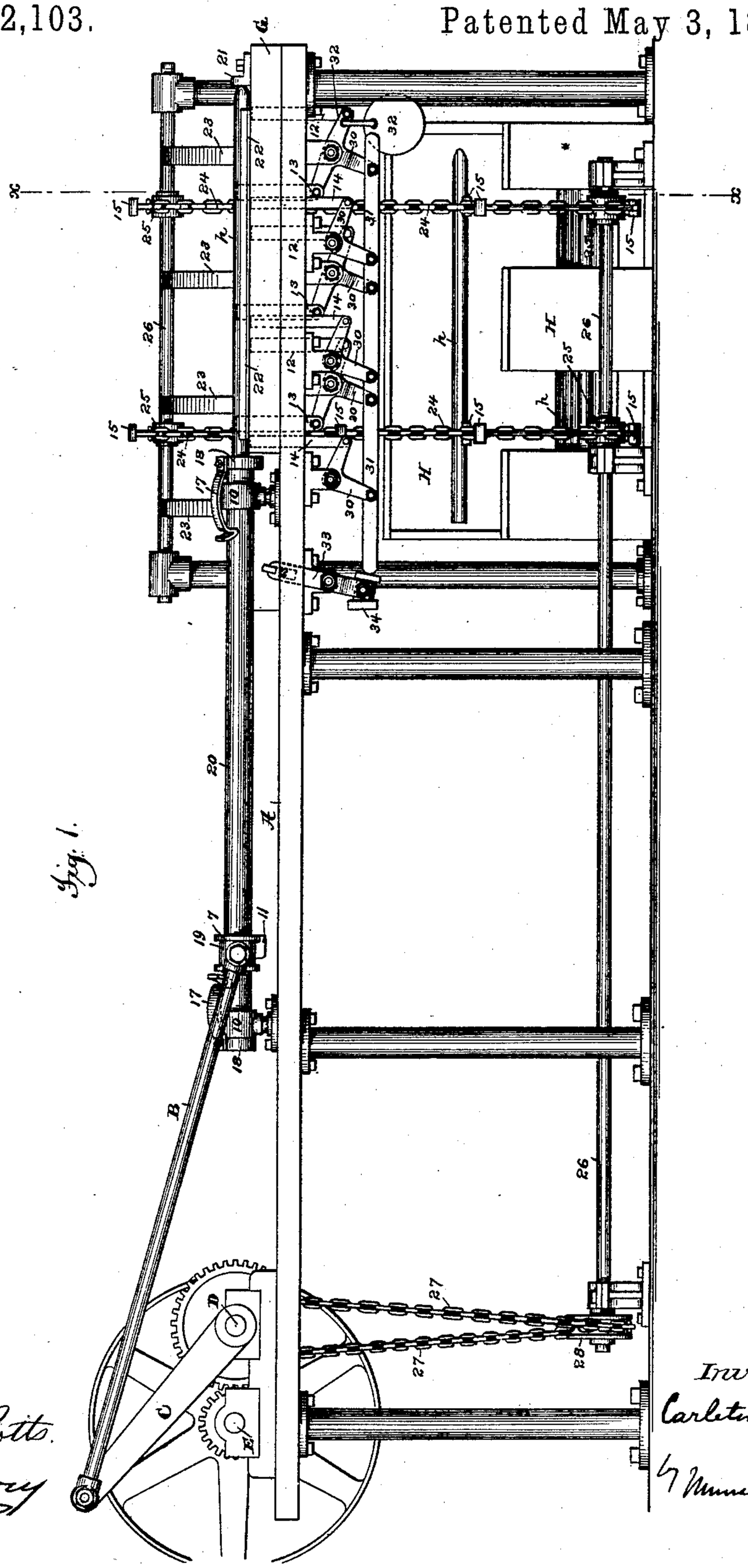

Fig. 1.

Attest:
Geo. H. Botts.
J. A. Hovey

Inventor:
Carleton W. Nason
by Munn & Philipp
Attys.

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MACHINE FOR INSERTING DIAPHRAGMS IN RADIATOR TUBES.

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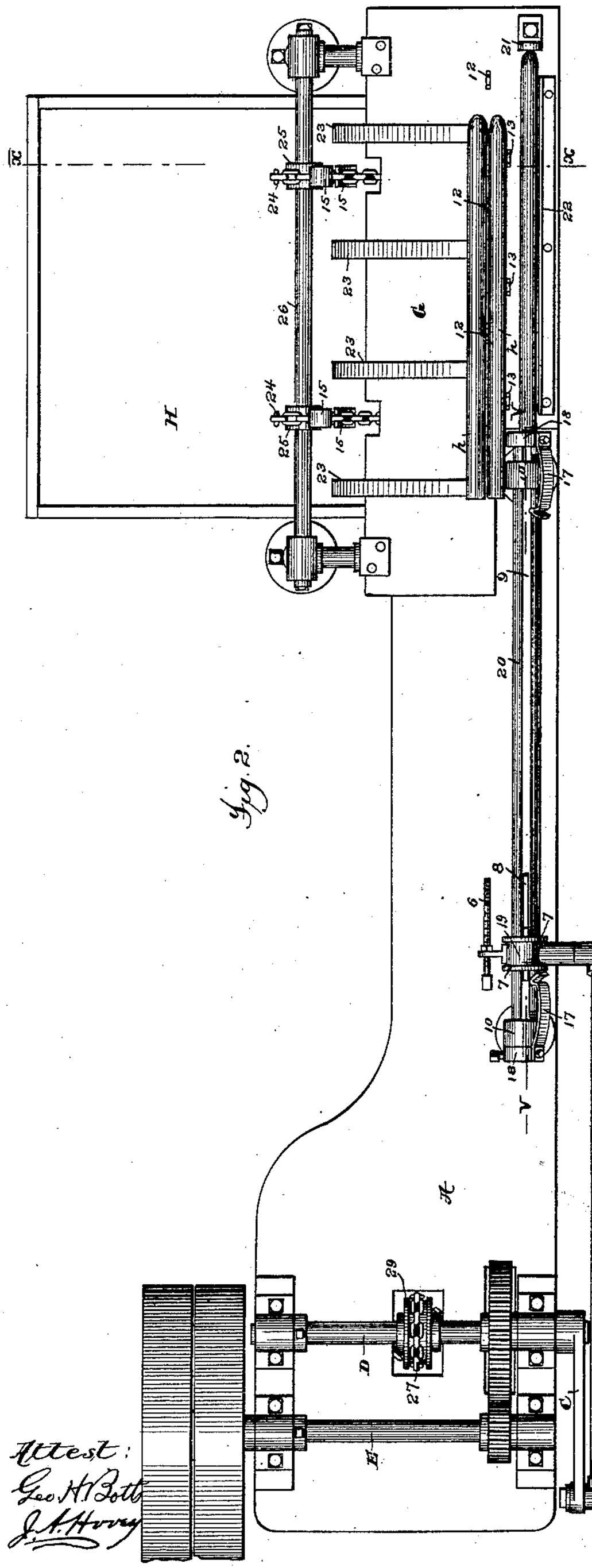

Fig. 2.

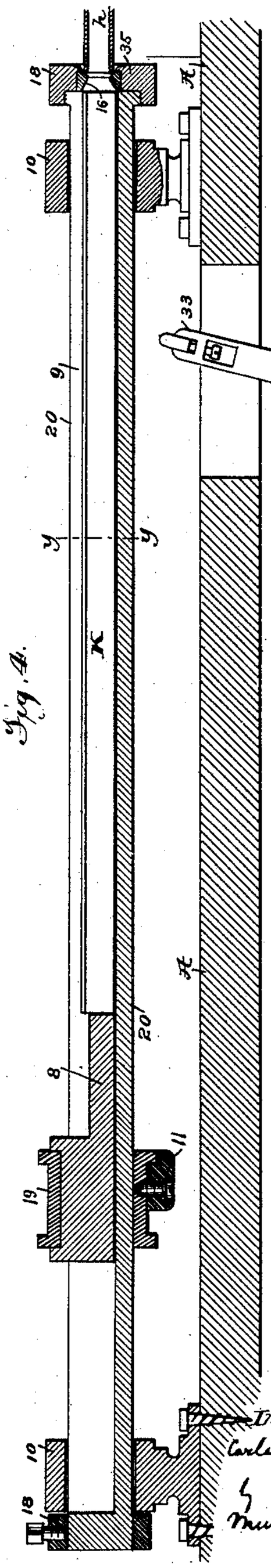

Fig. 4.

Attest:
Geo. H. Bott
J. A. Hovey

Inventor.
Carleton W. Nason
by Munson & Philipp
Attys:

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C. W. NASON.

MACHINE FOR INSERTING DIAPHRAGMS IN RADIATOR TUBES.

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Fig. 3.

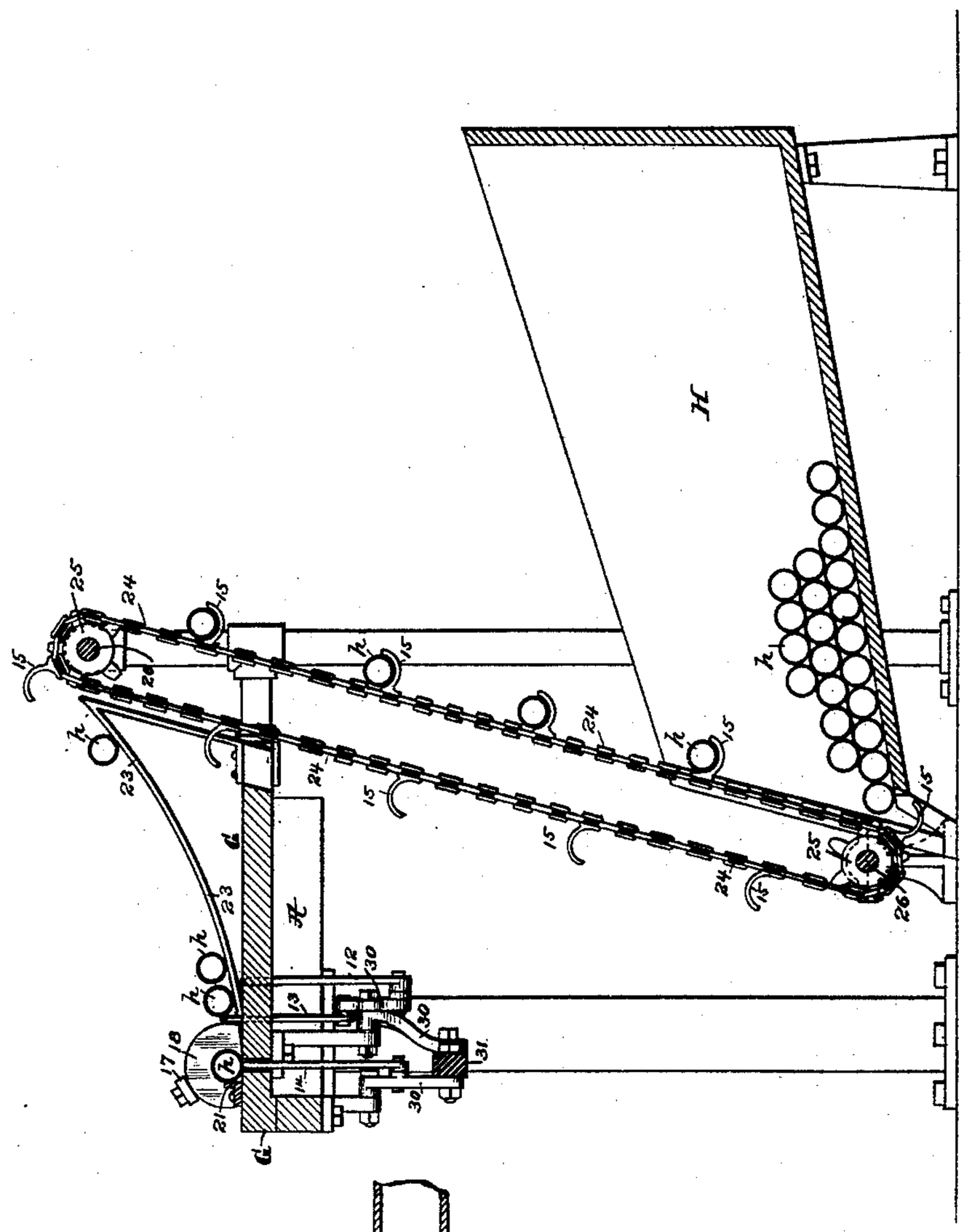
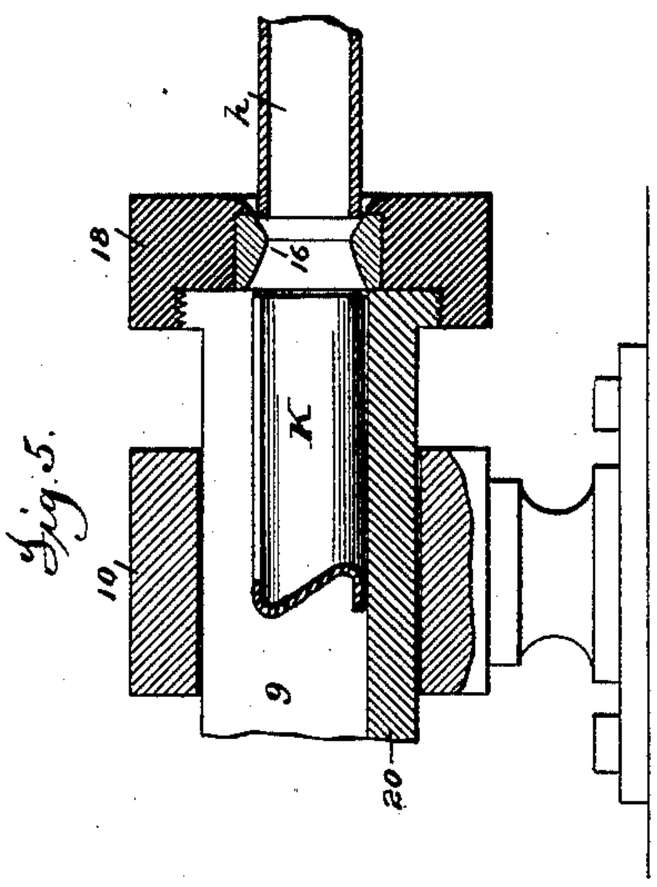


Fig. 5.



Attest:
Geo. H. Botts.
J. A. Hovey

Inventor:
Carleton W. Nason
by Munson Philipp
Attys.

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C. W. NASON.

MACHINE FOR INSERTING DIAPHRAGMS IN RADIATOR TUBES.

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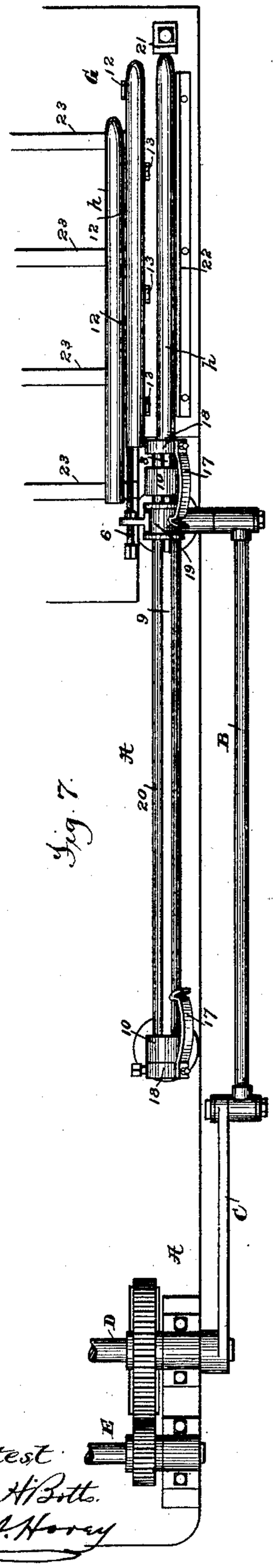

Fig. 7.

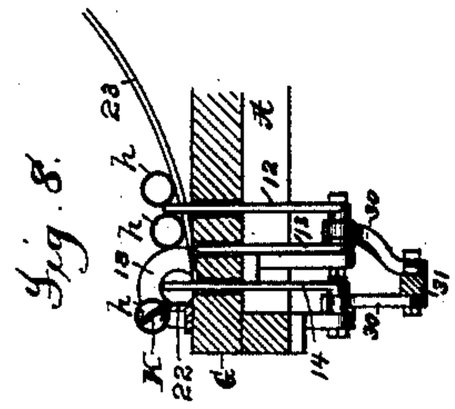

Fig. 8.

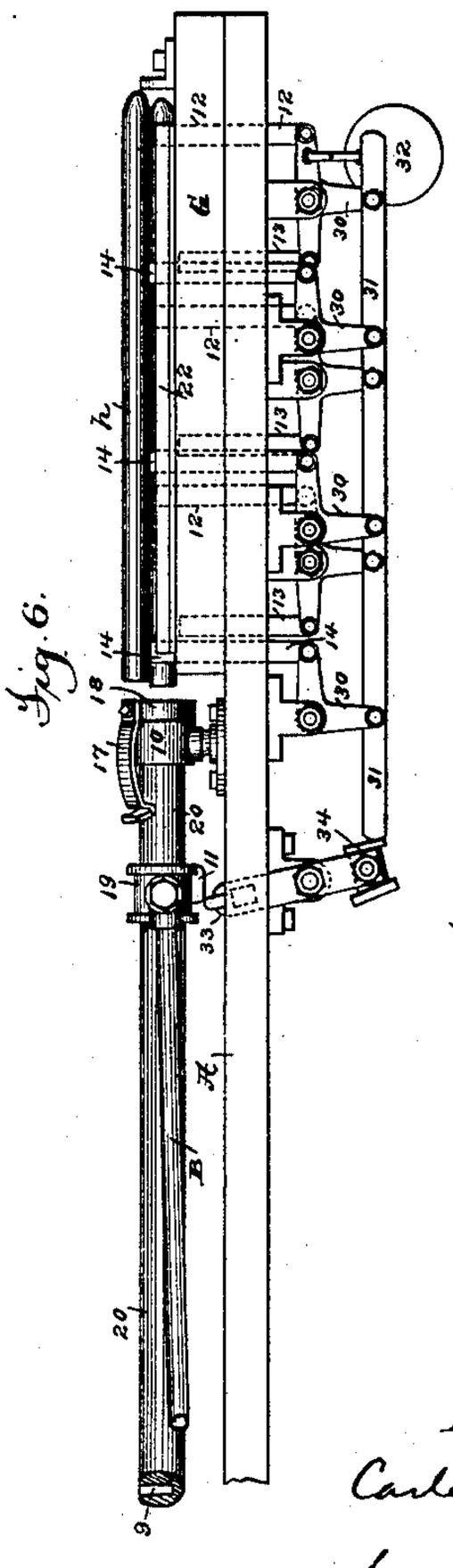

Fig. 6.

Fig. 10.

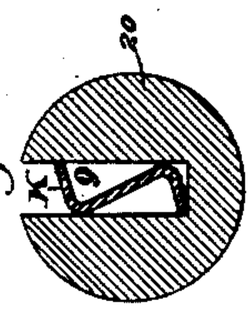

Fig. 9.

Attest:
Geo. H. Botts.
J. A. Harvey

Inventor:
Carleton W. Nason
by Munson & Philipp
Attys.

UNITED STATES PATENT OFFICE.

CARLETON W. NASON, OF NEW YORK, N. Y.

MACHINE FOR INSERTING DIAPHRAGMS IN RADIATOR-TUBES.

SPECIFICATION forming part of Letters Patent No. 362,103, dated May 3, 1887.

Application filed January 3, 1887. Serial No. 223,180. (No model.)

To all whom it may concern:

Be it known that I, CARLETON W. NASON, a citizen of the United States, residing at New York city, county of New York, and State of New York, have invented certain new and useful Improvements in Machines for Inserting Diaphragms in Radiator-Tubes, fully described and represented in the following specification, and the accompanying drawings, forming a part of the same.

Steam-radiators for heating purposes as commonly constructed consist of series of short vertical tubes—usually ordinary gas-pipe—which are closed at their upper ends and communicate at their lower ends with a main steam-pipe or a chamber or box, into which the steam is admitted. In order to secure good results, it is of course necessary that the steam should circulate through the radiator-tubes, and this it has been found can be effected by providing the tubes with longitudinal diaphragms or partitions, which extend from the lower open ends of the tubes to points near the upper closed ends of the tubes, as shown and described in United States Letters Patent No. 34,643, granted March 11, 1862. It has been found that when the tubes are provided with these diaphragms the steam will pass up the tube on one side of the diaphragm and down on the other side of the diaphragm, thus maintaining a constant circulation of the steam through the tubes, and consequently securing good results in heating.

The diaphragms with which the tubes are provided usually consist of strips of sheet metal, which are bent to approximately the form of the letter **Z** in cross-section, and are then forced into the tubes, so as to be slightly compressed, the spring of the metal in its tendency to resume its original shape thus serving to hold the diaphragm securely in the tube. The insertion of these diaphragms has heretofore been accomplished by hand, which was not only difficult, but, as these tubes have to be produced in very large quantities, this hand work has proved exceeding slow, laborious, and expensive.

The present invention relates to a mechanism which is especially designed for the performance of this work, and by which the work is accomplished in an easy, rapid, and economical manner and with very little hand manipulation.

An understanding of the present invention can be best given by an illustration and description of an organized mechanism embodying the same.

All further preliminary description will be omitted and a description of such a mechanism given, reference being had to the accompanying drawings, in which—

Figure 1 is a side elevation, and Fig. 2 a plan view, of the mechanism. Fig. 3 is an enlarged cross-section taken on the line *x x* of Figs. 1 and 2. Fig. 4 is a section upon a still larger scale, taken on the line *v v* of Fig. 2. Fig. 5 is a still more enlarged view of a part of Fig. 4. Figs. 6, 7, and 8 are views similar to Figs. 1, 2, and 3, but showing the parts in different positions to illustrate the operation of the mechanism. Fig. 9 is an enlarged cross-section taken on the line *y y* of Fig. 4, and Fig. 10 is an enlarged cross-section of one of the radiator-tubes after the diaphragm has been inserted.

Referring to said figures, it is to be understood that the working parts of the apparatus are supported upon a bed-plate, A, which is of suitable size and arranged at a convenient height. Located above this bed-plate is what I term a "guide," 20, which is of a length somewhat greater than the length of the diaphragms which are to be inserted into the radiator-tubes, and the primary function of which is to support the diaphragms so as to prevent them from bending or buckling under the pressure which is applied to force them into the tubes. This guide may be made in a variety of forms; but in the preferred construction it consists of a bar or rod having in its upper side a channel of sufficient width and depth to receive one of the diaphragms. The walls 9 of the channel thus form the guide proper and afford the necessary lateral support for the diaphragm. This guide is mounted in bearings 10, rising from the bed-plate A, and is arranged to have a limited longitudinal movement therein, for a purpose that will hereinafter appear. Between the bearings 10 the guide 20 is provided with a sliding head, 19, which is arranged to move freely along the guide and is provided with a driver or plun-

ger, 8, which moves between the walls 9 of the channel as the head reciprocates. The head 19 is pivotally connected by a pitman-rod, B, with a crank, C, mounted on a shaft, D, which is geared to a driving-shaft, E, which receives motion from any suitable source of power, the crank C being of such length as to move the head 19 along the guide 20 a distance at least equal to but usually somewhat more than the length of the diaphragm to be inserted into the radiator-tube. The guide 20 is provided at its ends, outside the bearings 10, with flanges or enlargements 18, which limit its longitudinal movement, and these flanges are provided with curved spring-catches 17, which extend inward in such position as to spring over and engage with flanges 7, formed on the head 19, as the head arrives at the end of its travel in each direction. The purpose of this will appear when the operation of the machine is described.

The channel formed in the guide 20 communicates at its forward end with a sleeve or die, 16, the opening in which is contracted near its forward or outer end to a diameter slightly less than the interior diameter of one of the tubes, and is flared at its inner end to a diameter somewhat greater than the greatest widthwise extent of one of the diaphragms, and is also flared at its outer end to a diameter somewhat greater than the exterior diameter of one of the tubes. The purpose of this feature will appear when the operation of the machine is described. The die 16 can be secured to the guide 20 in a variety of ways. As shown in the present case, it is secured by means of a cap, 35, which cap also forms the flange 18 at the forward end of the guide 20.

Located at the forward end of the guide 20 is a raised rest or platform, G, which is of such a height as to bring a radiator-tube, when it is placed thereon, directly opposite the opening in the die 16. The rest G is provided at its end, directly in line with the guide 20, with an abutment, 21, against which the end of the radiator-tube rests during the operation of inserting the diaphragm, and along its side with a stop, 22, which serves as a side support for the tube. The rest G is inclined upward and inward from the stop 22, or is provided with upwardly-inclined rails 23, so that whenever a tube is laid upon the rest or the rails it will have a tendency to roll downward until it is arrested by the stop 22 in position in front of the guide 20. The radiator-tubes may be placed upon the rest G or the rails 23 by hand; but it is preferable that they should be supplied automatically, and for this purpose there is provided at the base of the machine a hopper, H, into which the tubes, after they have been prepared to receive their diaphragms, are placed in large quantities.

Located in front of the hopper are two chains, 24, which pass around sprocket-wheels 25 upon shafts 26, located, respectively, at or below the lower front edge of the hopper and at or above the upper ends of the inclines 23. One of the shafts 26 is driven in any suitable manner, as by a chain, 27, passing around a wheel, 28, upon the shaft, and around a similar wheel, 29, upon the crank-shaft D. The chains 24 are provided with outwardly-projecting arms or hooks 15, which pass through slots in the front of the hopper H, and are so arranged that as each pair of the hooks is carried upward by the movement of the chains 24 they take one of the tubes *h* out of the hopper and carry it upward over the wheels 25, and discharge it onto the inclines 23, so that it will roll down to the front of the rest G, as best shown in Fig. 3. The shafts 26 are, as will be observed, so positioned that the chains 24 incline inward considerably over the hopper H. The purpose of this arrangement is to prevent more than one of the tubes from being carried upward at a time by any pair of the hooks. With the chains thus arranged, if more than one tube is taken, it will immediately fall back into the hopper.

Fulcrumed beneath the bed-plate A are a number of angle-levers, 30, each of which has one of its arms pivotally connected to a horizontal rod, 31, which extends inward and terminates beneath the guide 20. To the other arms of the levers 30 (some of which arms, as will be observed, extend inward, while the remainder extend outward) are pivoted vertical rods 12 13 14, which pass upward through openings in the rest G. The rods 13, which are pivoted to the inwardly-extending arms of the levers 30, pass upward through the rest G in position to be in line or about in line with the inner edge of the flange 18. The rods 14, which are connected to certain of the outwardly-extending arms of the levers 30, pass upward in position to be directly beneath and a slight distance inward from the longitudinal center of the tube *h*, which is at any time resting against the stop 22, and the rods 12, which are connected to the remaining outwardly-extending arms of the levers 30, pass through openings just the diameter of one of the tubes inward from the rods 13.

The outwardly-extending arm of one of the levers is provided with a weight, 32, which, through the rod 31, operates to hold all the levers normally in such position that the rods 13 will project for some distance above the top of the rest G, while the rods 12 14 will be moved downward, so that their upper ends will not project above the top of the rest. Located at the end of the rod 31 is a pivoted lever, 33, the lower end of which is provided with a head, 34, which is arranged to abut against the rod 31, while its upper end passes through a slot in the bed-plate A and is in position to be engaged by a projection, 11, on the lower side of the reciprocating head 19.

As the reciprocating movement of the guide 20 is quite limited, it follows that the distance between the forward end of the guide, when it is in its rearmost position, and the abutment

21 is but little more than the length of one of the tubes *h*. It is therefore necessary that the tubes should be presented accurately in order to have them roll into position between the abutment and the end of the guide. To insure this the hopper H is so located that the tubes, as they are delivered from the chains 24 and roll down the inclines 23, will be brought to rest against the rods 13, with their inner ends extending past the end of the guide 20, as shown in Fig. 2, and the head 19 is provided with a forwardly-extending rod, 6, which is so arranged that as the head is moved forward it will abut against the tube which rests against the rods 13, and move it forward to exactly the proper position to permit it to roll into position between the abutment 21 and the end of the guide 20 when the latter is retracted by the return movement of the head 19.

The operation of the machine thus organized is as follows: The hopper H being supplied with the tubes *h*, in condition to receive the diaphragms, and the machine being set in motion, the chains 24 will travel around the wheels 25, and the hooks 15 will take the tubes one by one from the hopper, and deposit them on the inclines 23, as shown in Fig. 3. The parts will be so timed that one of the tubes will be deposited on the inclines at each reciprocation of the head 19. As the first tube rolls down the inclines it will be brought to rest against the upwardly-projecting ends of the rods 13, and the subsequent tubes will be arrested behind the first. As the head 19 is moved forward after the first tube has been arrested by the rods 13, the rod 6 will come into contact with the end of the tube, as shown in Fig. 7, and move it forward into position to roll between the abutment 21 and the end of the guide 20. As the head 19 nears the limit of its forward stroke the projection 11 will come into contact with the upper end of the lever 33, and rock the lever so as to permit the projection to pass to the front of the lever, and directly after this, and as the head 19 reaches the limit of its forward stroke, the flange 7 of the head will pass under and be caught by the curved end of the spring-catch 17. As the movement of the head 19 is reversed and it commences to move backward along the guide 20, the flange 7 of the head will engage with the spring-catch 17 and draw the guide 20 backward from the position shown in Fig. 7 to the position shown in Fig. 6, in which position the guide will be arrested by the flange 18 coming into contact with the bearing 10, and the flange 7 will be withdrawn from under the spring-catch. Directly after this, as the head continues its backward movement, the projection 11 will engage with the end of the lever 33 and rock the head 34, carried by the lever, against the end of the rod 31, thereby moving the rod 31 forward, so as to rock the levers 30. As the levers 30 are thus rocked, the rods 12 14 will be raised and the rods 13 lowered, as shown in Fig. 8. This will allow the tube which has just been moved forward by the rod 6 to roll downward between the abutment 21 and the end of the guide 20 and against the rods 14. Immediately after this the projection 11 will pass by the lever 33, and as soon as this takes place the weight 32 will rock the levers 30, so as to raise the rods 13 and lower the rods 12 14, as shown in Fig. 3, and as soon as this takes place the tube *h*, which has been allowed to roll down against the rods 14, will roll into position against the stop 22, and at the same time the next tube will roll downward against the rods 13, as also shown in Fig. 3. As the head 19 reaches the limit of its rearward movement the flange 7 will pass under the end of the spring-catch 17 at that end of the guide, and while the head 19 is in this position, or just as it commences its return forward movement, the attendant will place one of the diaphragms K in the channel of the guide 20 in front of the driving-bolt 8, as shown in Figs. 4, 5, and 9. As the head 19 commences its return forward movement the flange 7, acting on the spring-catch 17, will move the guide 20 forward, thereby forcing the outer flaring end of the die 16 over the open end of the tube, which rests against the stop 22, and cause the tube to be centered directly in line with the channel of the guide 20, as shown in Fig. 5. As the head 19 proceeds upon its forward movement the driving-bolt 8 will abut against the end of the diaphragm in the channel and force the opposite end thereof into the inner flaring end of the die 16, thereby centering and slightly compressing the diaphragm, and as the head continues upon and completes its forward movement the diaphragm will be driven into the tube, as shown in Fig. 10. It will be seen that during this operation the diaphragm is supported laterally throughout its whole length by the walls 9 of the channel, so as to prevent all danger of its buckling or becoming bent in that direction by the force applied to drive it into the tube. As the head 19 arrives at the limit of its forward movement and completes the insertion of the diaphragm and commences its return movement, the operations already described will be repeated, and as the rods 12 14 are raised, the tube, into which the diaphragm has just been inserted having had its end freed from the die 16 by the inward movement of the guide 20, will be thrown upward by the rods 14, as shown in Figs. 6 and 8, so as to roll over the stop 22 and fall at the side of the machine. The abutment 21 is made adjustable, so that it can be moved to and secured in positions at different distances from the end of the guide 20, thereby allowing the machine to operate upon tubes of different lengths, and the wheels 25 are also adjustable upon the shafts 26 for the same purpose.

The organization which has been described embodies the invention in the most complete and perfect form which I have yet devised. It will be seen, however, that the mechanism

may be modified considerably as to many of its details, and also as to its organization, without wholly departing from the invention. It will also be seen that parts of the invention may be used without the whole.

The form of the guide 20 may be varied widely from what is shown, so long as its essential feature—viz., the lateral support for the diaphragm as it is being inserted—is preserved. Instead of being arranged horizontally, the guide may in some cases be arranged vertically. So, also, the form of the head 19 and of the driver or plunger 8 and the means for operating the latter may be varied from what is shown.

What is claimed is—

1. In a machine for inserting diaphragms in tubes, the combination, with a guide for affording lateral support to the diaphragm, of a driver reciprocating in said guide and means for automatically centering the tube in front of the guide, substantially as described.

2. The combination, with the guide 20, having the longitudinal channel for receiving, supporting, and guiding the diaphragm, and having the contracted opening for slightly compressing the diaphragm, of the driver 8, reciprocating in said channel, and means for supporting the tube at the end of the guide in position to receive the diaphragm, substantially as described.

3. The combination, with the longitudinally-reciprocating guide 20, having the channel and the opening flared at its outer end to center the tube, of the reciprocating driver 8, substantially as described.

4. The combination, with the reciprocating guide 20, having the channel and the opening flared at the outer end to center the tube and at the inner end to center and compress the diaphragm, of the reciprocating driver 8, substantially as described.

5. The combination, with the mechanism for supporting the tubes and inserting the diaphragms therein, of the hopper H and elevating mechanism for supplying the tubes in position to receive the diaphragms, substantially as described.

6. The combination, with the guide 20, having the channel, of the reciprocating head 19, having the rod 6, for moving the tubes into proper position, substantially as described.

7. The combination, with the mechanism for inserting the diaphragms, of the vertically-reciprocating rods 14, for discharging the tubes, substantially as described.

8. The combination, with the guide 20, of the reciprocating head 19, having the rod 6, and the vertically-reciprocating rods 13, for arresting the tube in position to be acted on by the rod 6, substantially as described.

9. The combination, with the guide 20, of the reciprocating head 19, the lever 33, arranged to be acted on by the head, the vertically-reciprocating rods 14, and connections for operating said rods from said lever, substantially as described.

10. The combination, with the guide 20, of the reciprocating head 19, the lever 33, arranged to be acted on by the head, the vertical-reciprocating rods 13 14, and connections for operating said rods from said lever, substantially as described.

11. The combination, with the guide 20, of the reciprocating head 19, the lever 33, arranged to be acted on by the head, the vertically-reciprocating rods 12 13 14, and connections for operating said rods from said lever, substantially as described.

12. The combination, with the reciprocating guide 20, having the channel, of the reciprocating head 19 and the spring-catches 17, arranged to engage with the head, substantially as described.

13. The combination, with the guide 20, having the channel and the reciprocating driving-bolt 8, of the abutment 21 and stop 22 and an inclined support or way whereby the tubes take their proper position by gravity, substantially as described.

14. The combination, with the guide 20, having the channel and the reciprocating driving-bolt 8, of the abutment 21 and stop 22 and an inclined support or way whereby the tubes take their proper position by gravity, and the elevating apparatus for depositing the tubes upon the support or way, substantially as described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

CARLETON W. NASON.

Witnesses:
J. A. HOVEY,
T. H. PALMER.