Oct. 4, 1949. JEAN-FELIX PAULSEN 2,483,709

APPARATUS FOR VULCANIZING TUBULAR ARTICLES

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Fig. 1

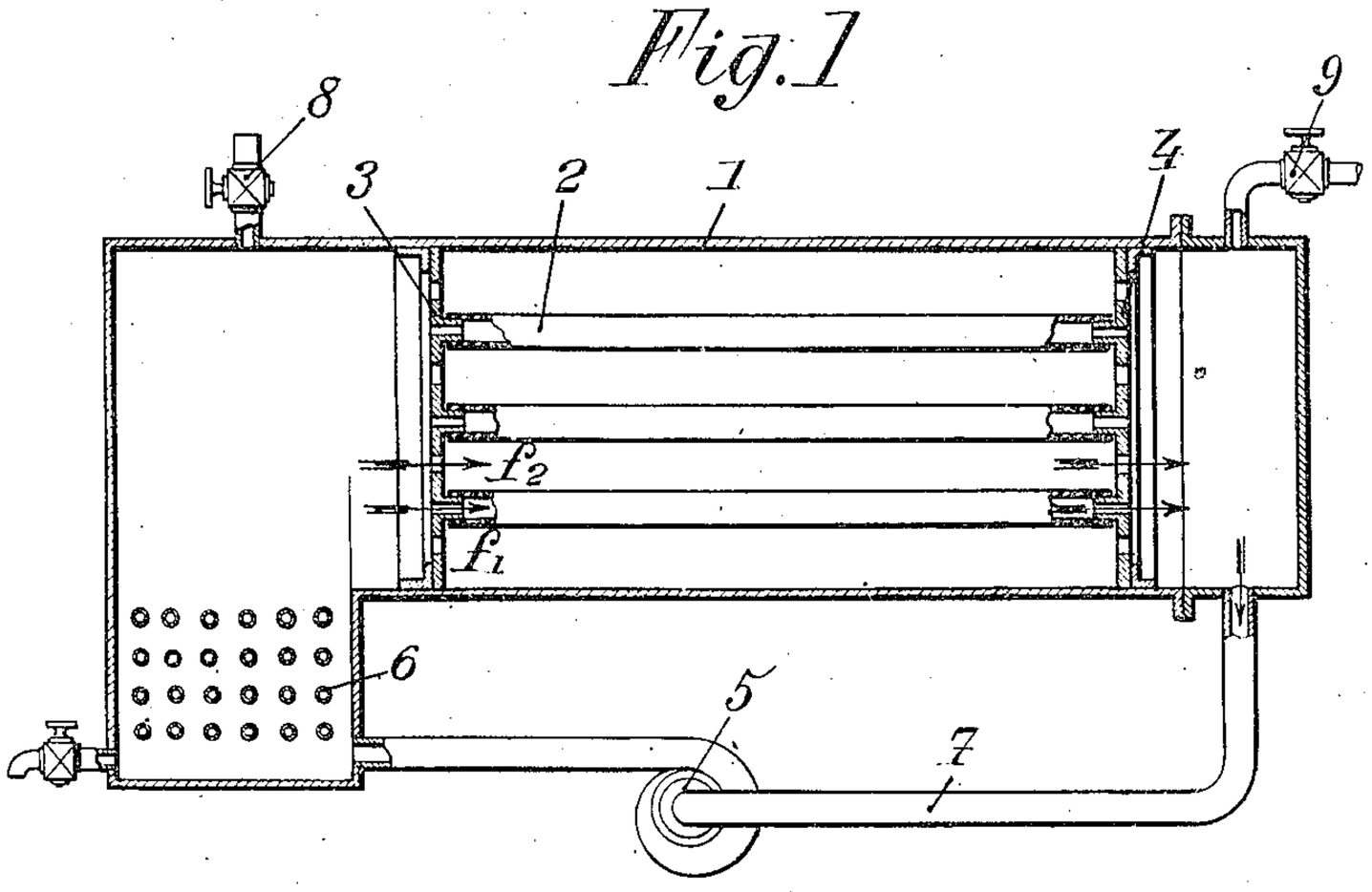
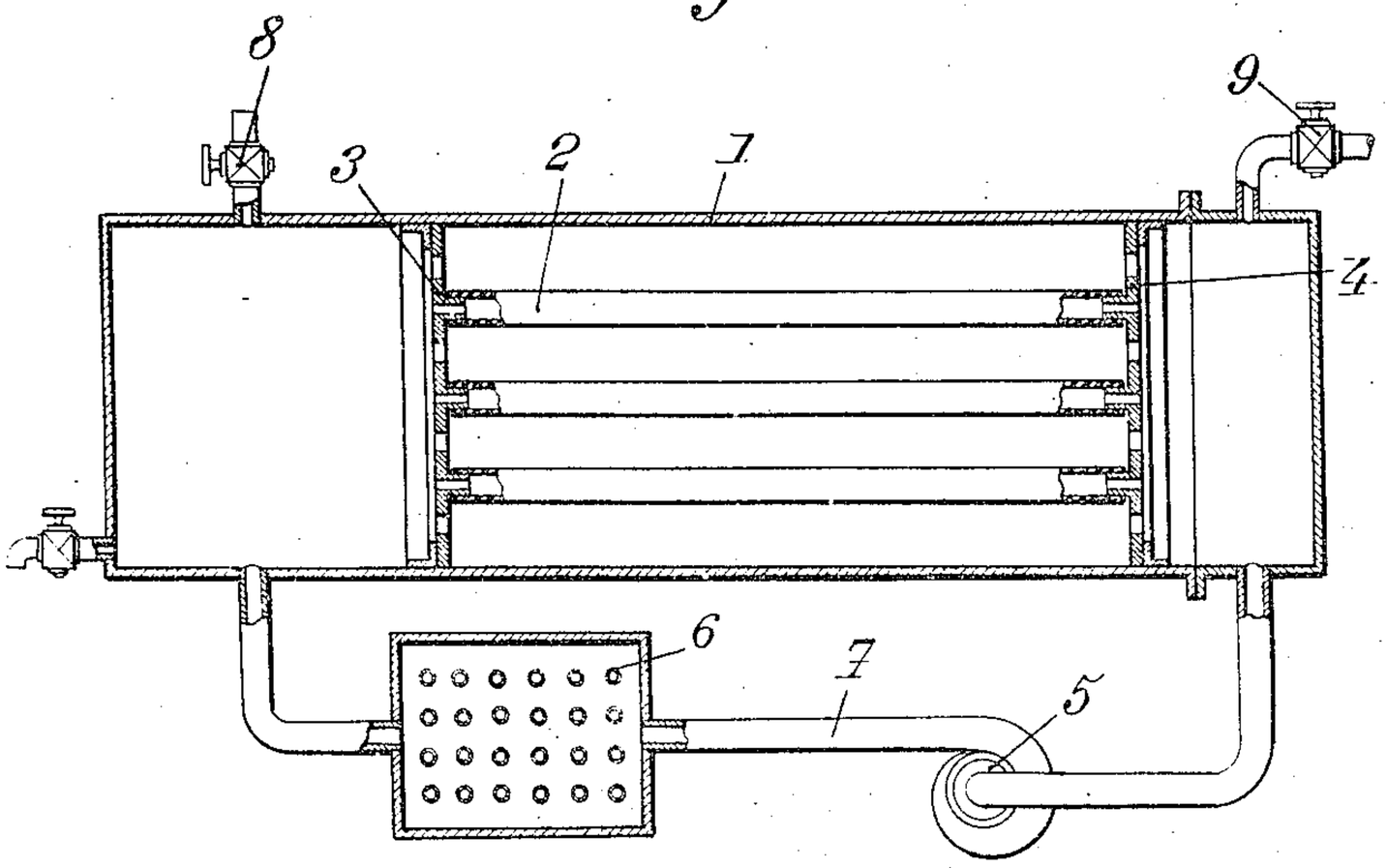


Fig. 2



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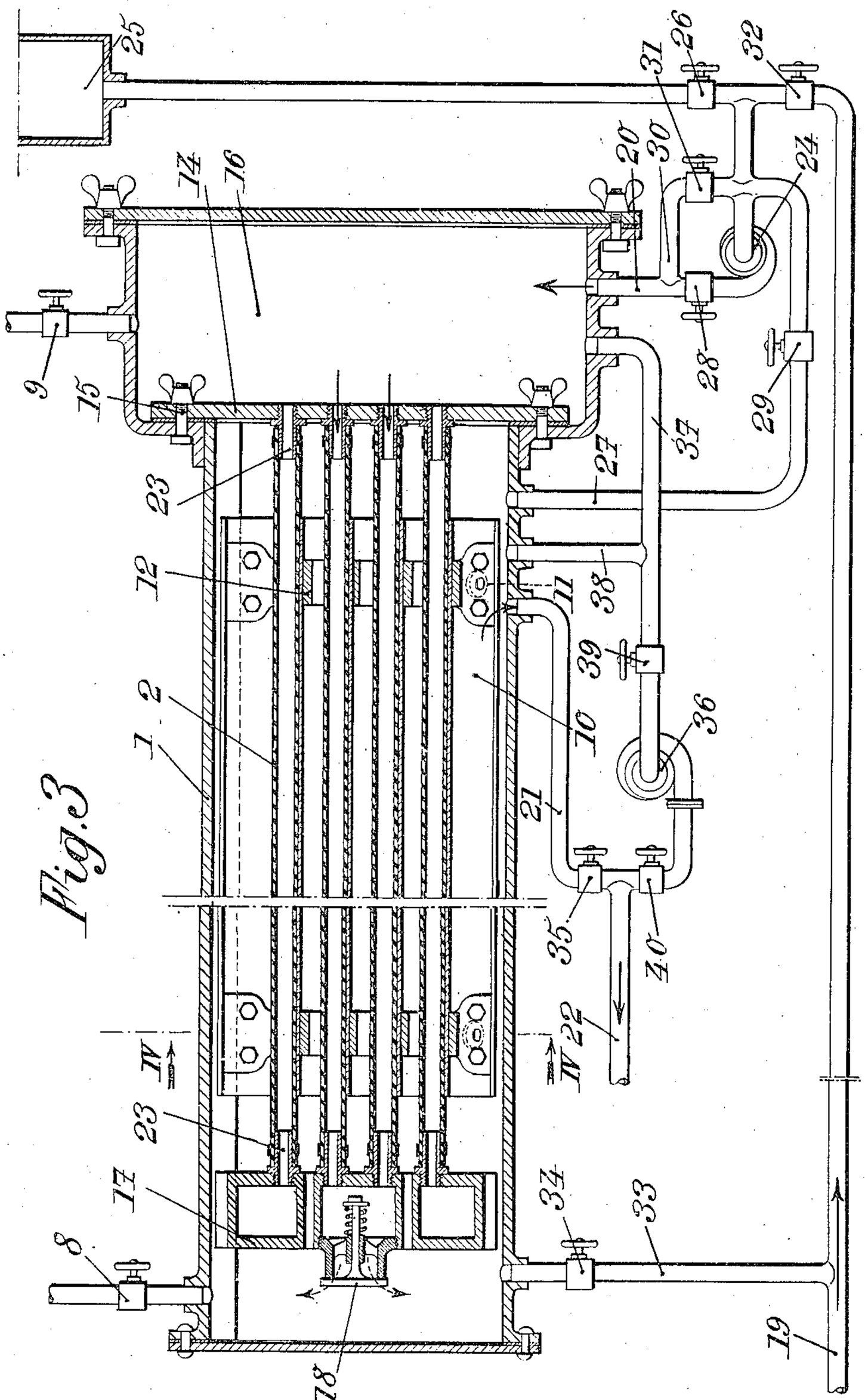

Fig. 3

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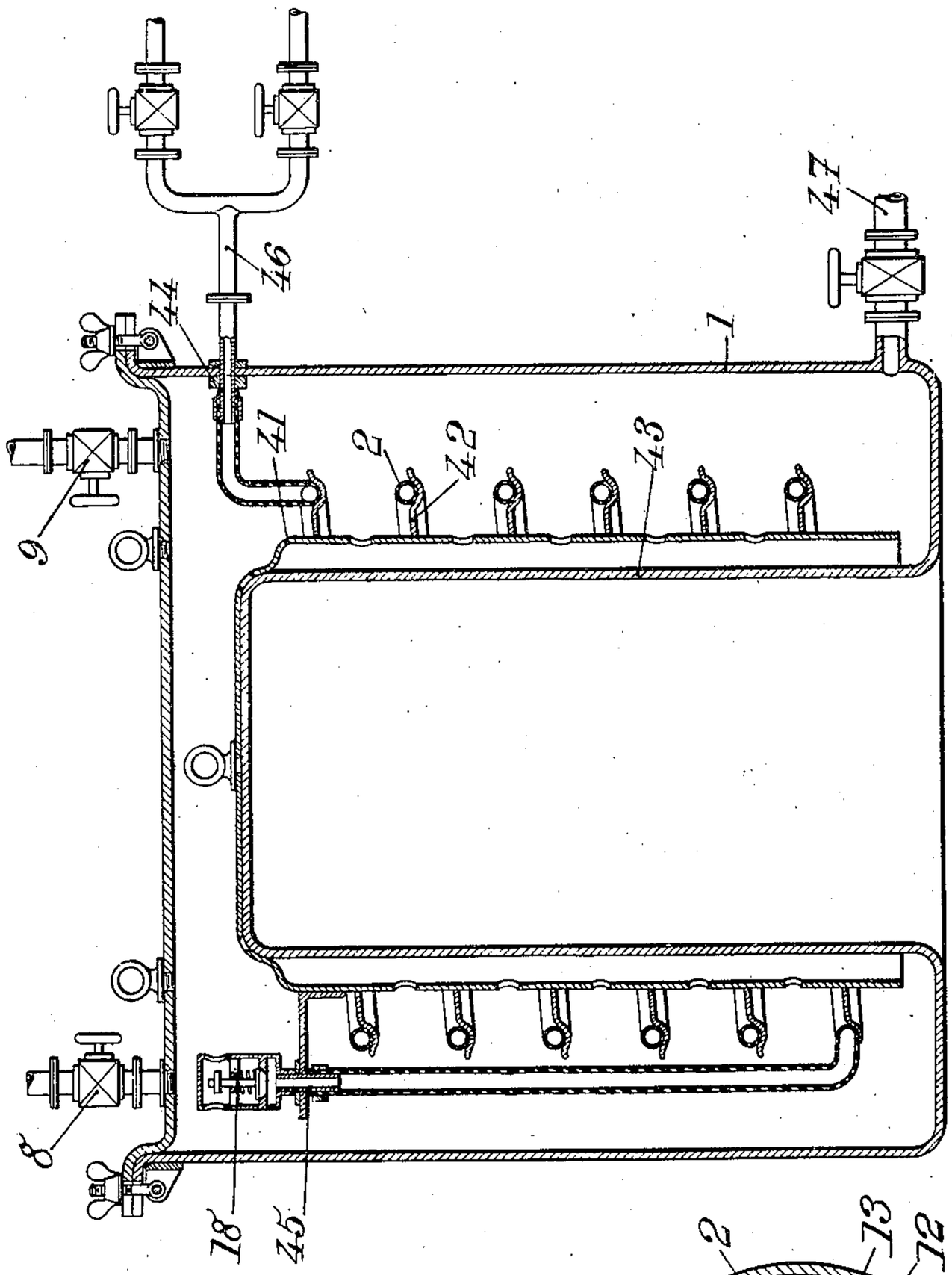

Fig. 5.

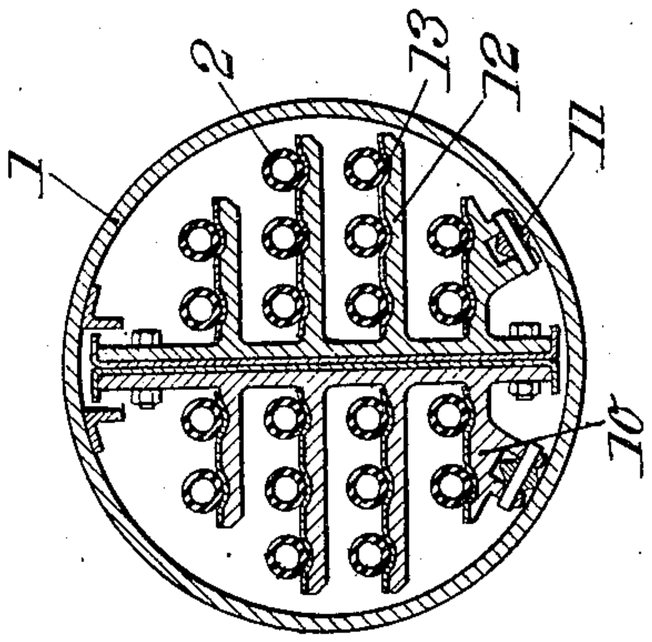

Fig. 4.

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APPARATUS FOR VULCANIZING TUBULAR ARTICLES

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Patent expires June 1, 1963

3 Claims. (Cl. 18—6)

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My invention relates to machines for vulcanizing elongated articles made of vulcanizable material and more particularly of tubular articles such as flexible or semi-flexible rubber hose pipes.

One object of my invention is to provide apparatus whereby the articles to be treated are vulcanized by contact with a fluid at an appropriate temperature, e. g. water or steam, and if necessary under pressure.

Another object of my invention is to circulate the fluid with which the articles are brought into contact.

A further object of my invention, in the case of tubular articles, is to circulate the vulcanizing fluid internally and externally of the articles.

Still a further object of my invention, in the case above-referred to, is to maintain the fluid at a higher pressure in the inside of the tubular articles than in the space exterior to the same.

My invention also refers to a machine comprising a pressure resisting container, a support for the tubular articles to be vulcanized and means to circulate a liquid through the container and through the articles themselves, the latter being wound into a helix, when convenient.

In the annexed drawings:

Fig. 1 is a diagrammatical longitudinal section of an apparatus established in accordance with my invention.

Fig. 2 shows a modification thereof.

Fig. 3 is a longitudinal section of another modification.

Fig. 4 is a transverse section taken along line IV—IV of Fig. 3 to show the internal hose supporting carriage.

Fig. 5 is a vertical section of another embodiment of my invention.

The apparatus illustrated in Figs. 1 and 2 comprises a container 1 provided with a suitable door (not shown). The hoses 2 to be vulcanized are longitudinally disposed in parallel respective relation between appropriate supports 3 and 4 within the container 1. Supports 3 and 4 are in the form of perforated plates provided with a plurality of nipples on which pipes 2 are engaged by their ends. Container 1 is filled with hot water and it is strong enough to withstand an inner pressure corresponding to a water temperature of about 120 to 150° C. or more.

There is provided a water circulating pump 5 and steam tubes 6 whereby water may be heated and maintained at the desired temperature. In the construction of Fig. 1 tubes 6 are disposed in container 1 itself, while in Fig. 2

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they are placed in a separate heater inserted on one of the pipes connecting pump 5 with container 1.

Valves 8 and 9 are provided to permit discharge of the air from the container.

In operation hot water is circulated through the hoses 2 to be treated, as shown by the arrows f_1 in Fig. 1, and also between the successive hoses, as indicated by arrows f_2, which ensures a perfect and regular vulcanization.

It will be apparent for any one skilled in the art that the water used as a heating medium for the hoses could be itself heated by any appropriate means, such as, for instance, electric resistances disposed internally or externally with respect to container 1; also that when a hot water line is available, container 1 may be directly filled with water under pressure from the same.

In any case, thermostatic means could be provided to maintain the temperature at the desired value.

In the construction of Fig. 3, hoses 2 are supported by a movable carriage 10 provided with wheels 11 and so formed that it may be introduced into container 1, which is circular in vertical cross-section. Carriage 10 is formed with transverse arms 12 having longitudinal grooves 13 adapted to receive hoses 2.

At one end of carriage 10 the ends of hoses 2 are fixed on nipples 23 carried by an end plate 14 which is tightly fixed to container 1 by bolts 15 within a sort of pre-chamber 16 also provided with a removable end plate or cover 16*a* through which carriage 10 is introduced into container 1. And at the opposed end of carriage 10 hoses 2 are similarly connected with nipples 23 carried by a hollow circular header 17. Header 17 may be supported by carriage 10 or it may rest on the bottom of container 1. In any case it is so arranged that it does not hinder water circulation through container 1. The inner space of header 17 communicates with container 1 through a spring-loaded valve 18.

Hot water under pressure is derived from a hot water line 19 and it is introduced into chamber 16 by a pipe 20. It passes through hoses 2, enters header 17 and passes through valve 18 which causes a determined pressure drop. Thence water returns to the right of Fig. 3 between hoses 2 and it is returned to the hot water producer by pipes 21 and 22, the first one opening in the vicinity of plate 14, as shown.

The plant is arranged to permit the following operations:

1. Quick filling of container 1 with hot water at about boiling temperature, before vulcanization.

2. Circulating water at more than 100° C. such water being taken from the hot water line.

3. Quick discharge of the water after vulcanization.

The first operation is effected by means of a hot water tank 25 disposed at a higher level than container 1 in such a manner that water from tank 25 may flow into container 1 by gravity when the corresponding valve 26 is open. But it is generally of advantage to use a pump 24 and a corresponding piping, the whole being so devised that the presence of steam spaces is avoided. Pump 24 forces water into chamber 16 through pipe 20 provided with a valve 28.

Pump 24 is also connected with container 1 by means of a suction pipe 27 provided with a valve 29, whereby pump 24 may draw water from the container. There is also preferably provided a pipe 30 with valve 31, by means of which pump 24 may be by-passed, when desired.

The vulcanization may be performed by means of a separate pump, or preferably by means of pump 24 itself, the suction thereof being connected with line 19 through a valve 32, while valves 26, 29 and 31 are closed. Hot water from line 19 is then circulated as indicated by the arrows, i. e. it enters chamber 16, passes through hoses 2, escapes through valve 18, flows back through container 1 and is finally discharged through pipes 21 and 22. A valve 35 is provided on pipe 21.

When the vulcanizing operation is performed, container 1 may be discharged by means of a pump 36, the suction of which is connected with container 1 and chamber 16 through a valve 39 and pipes 37—38 respectively. The discharge of pump 36 is connected with pipe 22 through a valve 40. Pipe 38 is provided with a valve 50 which is opened at the beginning of the discharging operation.

In the construction of Fig. 5 a hose 2 to be vulcanized is helicoidally disposed around an appropriate vertical cylindrical support 41 which is removably placed within a container 1. Hose 2 rests on a grooved strip 42 helicoidally fixed around support 41. The latter is bell-shaped and fits on a vertical extension 43 of the bottom of container 1 which is closed by a removable cover 1*a*.

One end of hose 2 is connected with the end 44 of the hot water pipe 46 while its other end is connected with a tube 45 opening into a box-like member enclosing the spring-loaded discharge valve 18. Water is discharged from container 1 through a pipe 47.

The operation is the same as in the case of Fig. 3, but the hose pipe to be vulcanized has not

to be cut into a number of relatively short sections. On the other hand, it must be flexible enough to permit its winding around support 41.

I claim:

1. A vulcanizing machine for flexible elongated tubular articles each having at least two ends comprising a pressure-resisting container provided with a removable cover; a removable vertical support within said container; means on said support engaging negligible surface areas of said articles to carry the flexible tubular articles to be vulcanized in helicoidal spaced formation substantially co-axial with said support; means on the bottom of said container to carry said removable support; means to force a hot liquid under pressure directly into one end of said articles from the exterior of said container so as to contact substantially the entire inner surface areas of said articles; means to discharge liquid from the other end of said articles into said container for contact with substantially the entire exterior surface areas of said articles; and means to discharge liquid from said container.

2. In a machine as claimed in claim 1, pressure reducing means fixed to the discharge end of said flexible articles.

3. A vulcanizing device for flexible elongated tubular articles, including a container, means within said container for helically supporting an article to be vulcanized, means for passing vulcanizing fluid into one end of said article to contact substantially the entire inner surface of the article and out of the other end into said container, said supporting means engaging negligible surface areas of said article so as to leave exposed substantially the entire outer surface area of said article for direct contact with vulcanizing fluid issuing from said article into said container.

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