

No. 615,187.

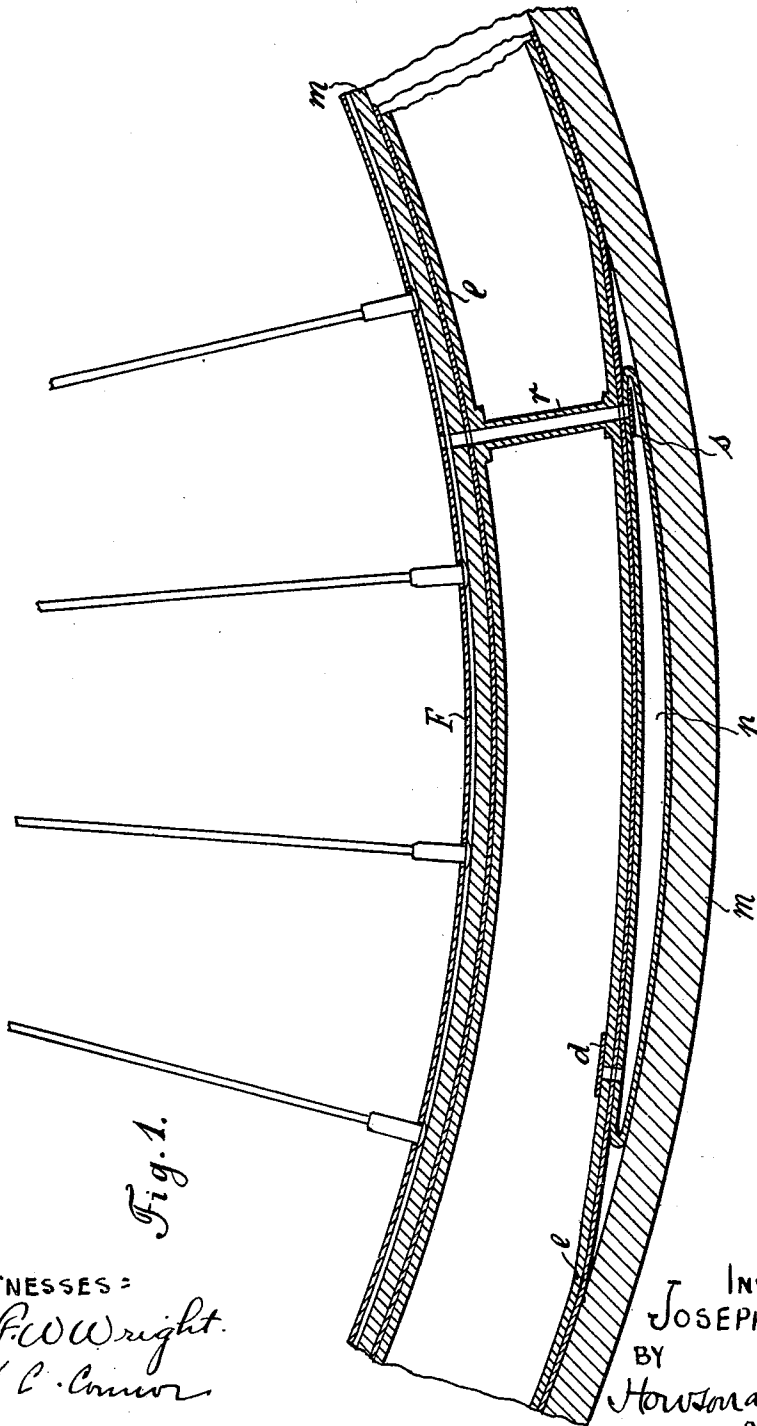
Patented Nov. 29, 1898.

J. KERSTING.
AUTOMATIC AIR PUMP FOR TIRES.

(Application filed Feb. 1, 1898.)

(No Model.)

3 Sheets—Sheet 1.



WITNESSES:

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L. C. Connor.

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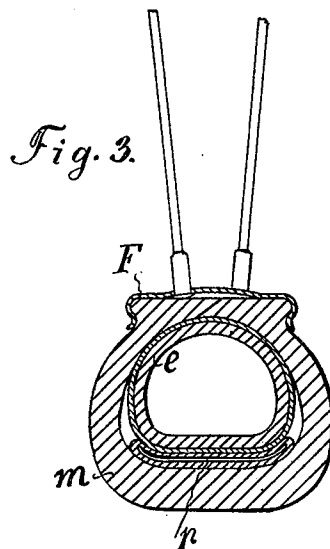
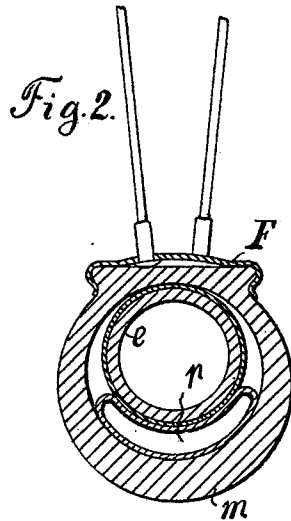
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3 Sheets—Sheet 2.



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3 Sheets—Sheet 3.

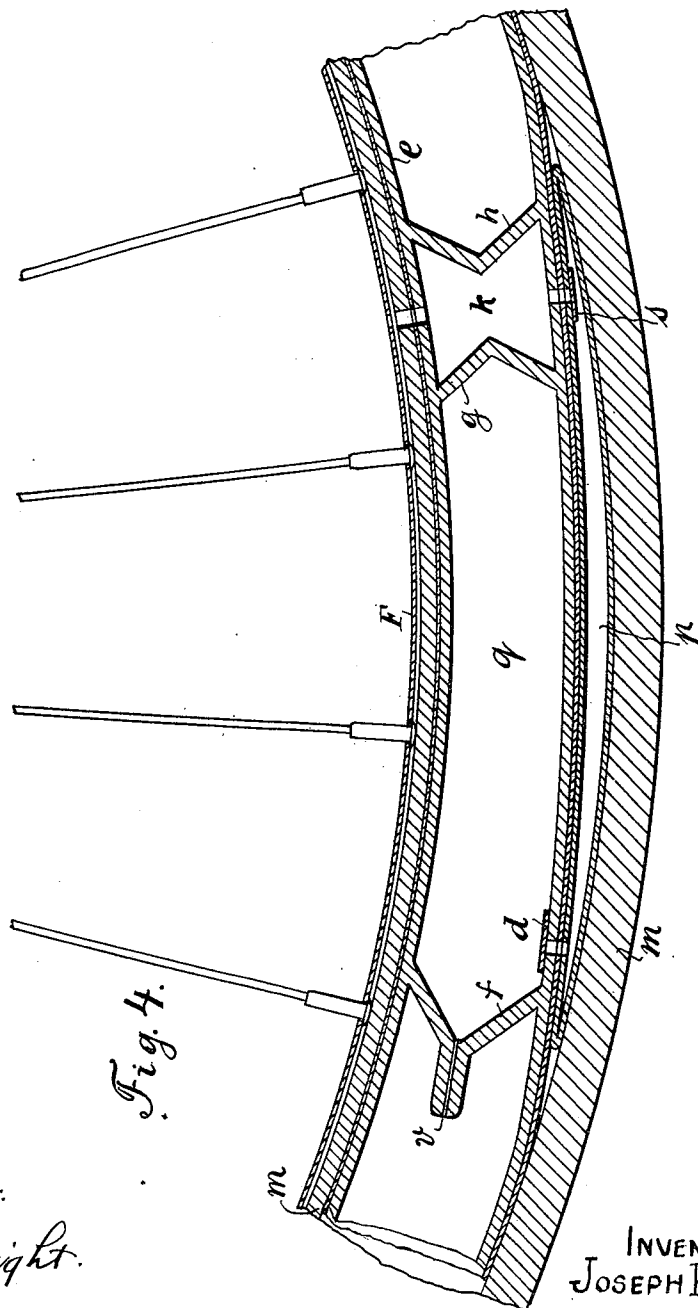


Fig. 4.

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UNITED STATES PATENT OFFICE.

JOSEPH KERSTING, OF BERLIN, GERMANY.

AUTOMATIC AIR-PUMP FOR TIRES.

SPECIFICATION forming part of Letters Patent No. 615,187, dated November 29, 1898.

Application filed February 1, 1898. Serial No. 668,748. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH KERSTING, of No. 39 Falkensteinstrasse, Berlin, in the German Empire, have invented certain new and useful Improvements in Automatic Air-Pumps for Velocipede and other Pneumatic Tires; 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.

In cycling it often happens that the tires become slack during riding, thus causing much inconvenience. This is more especially the case when the air-tube is punctured at any part. Many attempts have already been made to obviate these disadvantages by combining the tire with an arrangement whereby air is automatically compressed into the air-tube during riding. The arrangements of this kind which have become known heretofore cannot be brought to any practical success, since they possess various faults which interfere with their action. In these arrangements one or more pump cells or chambers are built into the air-tube and are either unsupported or are supported or reinforced by a full or solid piece of india-rubber. In the first case the incipient inflation of the air-tube prevents the complete pressing together of the pump cell or chamber, and the pressure of the air contained in the air-tube and surrounding the pump-cell on the walls thereof prevents the reëxpansion of the said cell or chamber, and consequently also the drawing in of fresh quantities of air. In the second case the action of the pump is likewise considerably interfered with by the pressing in of its walls on increasing pressure, since the supporting or reinforcing piece of solid india-rubber displaces the center of gravity of the wheel from the axis thereof and as long as the pump is in operation causes an unbearable jarring or series of shocks, whereby the spokes of the wheel are loosened. Moreover, the inflation of the quite flat or slack tire by means of this arrangement is practically almost impossible by reason of the small delivery of the pump and the violent

shocks. In order to obviate these disadvantages, according to the present invention the pump cell or chamber is arranged outside the air-tube, and it is supported in order to obtain complete pressing together thereof on a contracted part of the air-tube, to which at this particular place the somewhat greater resistance necessary for this purpose is imparted. At the place in question by arranging transverse walls or partitions in the interior of the air-tube a second pump cell or chamber can be provided which acts in conjunction with that first mentioned, whereby when commencing to inflate a completely flat or slack tire the amount of air delivered is considerably increased.

In the accompanying drawings, Figure 1 is a longitudinal section of an automatic pump; Fig. 2, a cross-section through the same in its uncompressed state; Fig. 3, in its compressed state; Fig. 4, a modification in which a second chamber is provided in the interior of the air-tube by means of transverse partitions.

In carrying my said invention into practice the air-tube *e*, arranged in the interior of the protective cover or sheath *m*, is contracted at *a* and its walls are somewhat stouter along a suitable part of its length, so that it there possesses greater elasticity than at the remaining part of the tube. Under the action of the circumferential tension of the air-tube the contracted part of the tube lies on the inner side of the protective cover or sheath, so that there is a free space on the outer side of the wheel within the cover or sheath. In this space is arranged the pump cell or chamber *p*, which can be made of vulcanized india-rubber, india-rubber with insertion, or other material. The walls of this cell or chamber can either be secured to the air-tube and cover or sheath, so that they are continuously extended again by the elasticity of these parts after pressing together, or their walls must themselves have sufficient elasticity, in which case they need not be secured to the cover or sheath *m*.

The pump cell or chamber *p* is provided with an inlet-valve *s* and a delivery-valve *d*, and to the former the atmospheric air is supplied in any suitable manner—for example, through a tube *r*, passing transversely through

the air-tube *e* and opening at the rim or felly *F*, while the air passes into the interior of the air-tube through the delivery-valve.

If in the rotation of the wheel the part of
 5 the protective cover or sheath which contains the contracted part of the air-tube and the pump cell or chamber *p* rests on the ground, this part is pressed together under the weight of the rider. In this manner the cell *p* is
 10 pressed flat between the cover and the thickened walls of the contracted part of the air-tube, and the air contained in this cell escapes through the delivery-valve *d* into the air-tube *e*. In this the contracted part of the air-tube
 15 presents an effective support for the pump cell or chamber. The resistance necessary for this purpose is imparted to this part of the air-tube partly by the internal pressure and partly by the elasticity of the material.
 20 Since the air which the cell contains is forced through the delivery-valve into the interior of the air-tube when the pressure thereof is only a little higher than that of the air already contained in the air-tube *e*, the pumping
 25 action of the cell or chamber *p* is entirely independent of the pressure which exists in the interior of the air-tube. The constant elasticity of the material of the contracted part of the air-tube in this arrangement will
 30 consequently always offer a certain excess of resisting power, so that the resistance of the delivery-valve will be overcome and the pump cell or chamber emptied as long as the tire is sufficiently pressed together for this purpose.
 35 As soon as the part of the tire containing the air-pump has left the ground the pump-cell *p* again extends itself by virtue of its own elasticity, or if its wall is made thin and is secured to the protective cover or sheath *m*
 40 by the effect of the latter it draws in air through the inlet-valve, which air in the next operation of the pump is forced into the air-tube *e*. As soon as the pressure in the air-tube has risen to such a degree that the pressing
 45 together of the tire is less than corresponds to the contraction in the air-tube complete pressing together of the pump-cell no longer takes place. After each pressing together some air under pressure consequently
 50 remains in the cell, which before a fresh quantity of air can be again drawn in must first expand to the atmospheric pressure. On further increase of the pressure and the consequent decrease in the pressing together the
 55 latter is no longer sufficient to bring the air to a higher pressure than that in the air-tube, so that the delivery-valve no longer opens and the delivery or pumping action of the pump ceases. The pump-cell remains thus in a
 60 charged or distended condition filled with a certain quantity of air at the pressure of the air-tube, which on cessation of the pressure always re-expands to the atmospheric pressure

and in this condition entirely fills the cell, so that further drawing in does not occur.

In order to obtain a rapid action of the
 65 pump when commencing to ride with a quite deflated air-tube, it is advantageous to form a second pump-cell above mentioned, this being effected by arranging transverse parti-
 70 tions *f g* in the contracted part of the air-tube *e*, as represented in Fig. 4. For this purpose one of these transverse partitions is provided with a valve *v*, and on the other
 75 side of the cell or chamber formed by these partitions is arranged a third partition *h*, so as to form a small auxiliary chamber *k*, which is in communication with the external air
 80 through an aperture in the protective cover or sheath and in the rim or felly and enables this air to have access to the inlet-valve *s* of the cell or chamber on the exterior of the air-
 85 tube. Obviously this small auxiliary chamber *k* may be omitted and the said inlet-valve *s* brought into communication with the ex-
 90 ternal air through a tube *r*, as in the arrangement Fig. 1. The air passes thus into the pump-cell external to the air-tube, and thence into the pump-cell internal to the air-tube, whence it passes into the air-space of the tire.

My improved air-pump, as I have proved by experiment, pumps in the necessary amount of air very rapidly, renders a hand-pump unnecessary, and obviates the detrimental effect of punctures or other injuries of the air-tube
 95 by continuously replacing the air which has escaped therefrom.

I claim as my invention and desire to secure by Letters Patent—

1. In a pneumatic tire, the combination of
 100 an outer sheath, an inner air-tube having a contracted portion, a pump cell or chamber between the outer sheath and the outer side of the said contracted portion of the inner
 105 air-tube, a passage through the said tube communicating with the outer air, an inlet-valve from said passage to the chamber and a delivery-valve connecting the chamber with the air-tube, substantially as described.

2. The combination, with a pneumatic tire
 110 and a pump-cell arranged outside a contracted part of the air-tube thereof and provided with inlet and delivery valves, of a second pump-cell in the said contracted part of the
 115 air-tube, separated off from the air-space of the said tube by means of transverse partitions, and in communication with the said air-space through a self-acting valve, substantially as described.

In testimony that I claim the foregoing as
 120 my invention I have signed my name in presence of two subscribing witnesses.

JOSEPH KERSTING.

Witnesses:

CHAS. H. DAY,
 MAX. C. STAHLER.