No. 825,719. PATENTED JULY 10, 1906.

M. F. GUTERMUTH.

HYDRAULIC AIR COMPRESSOR.

APPLICATION FILED APR. 29, 1902.

Fig. 1.

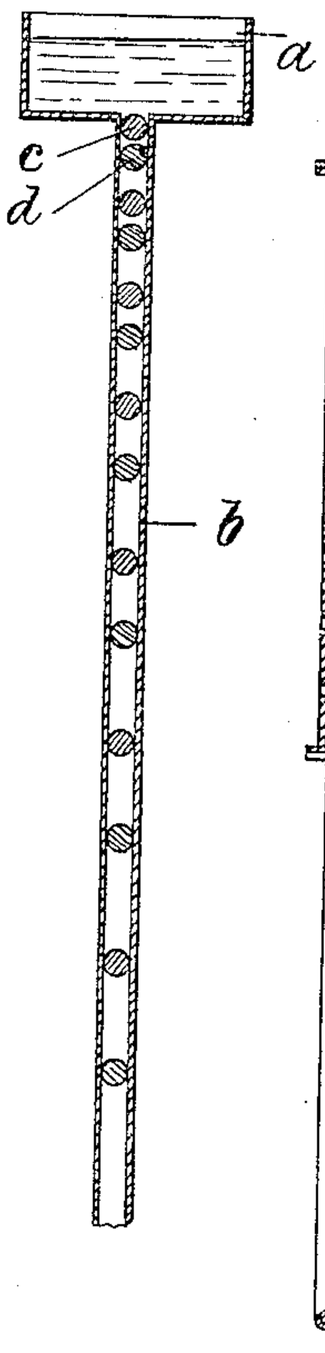

Fig. 2.

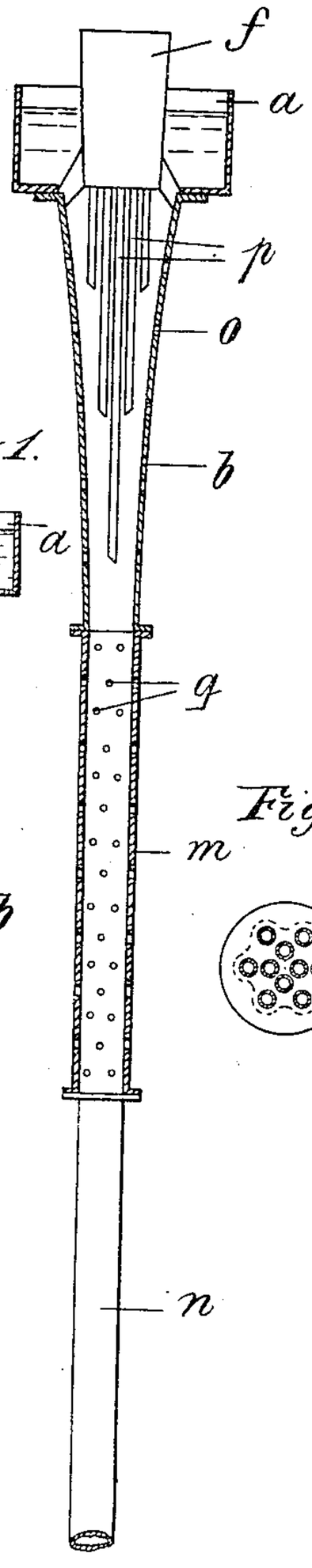

Fig. 3.

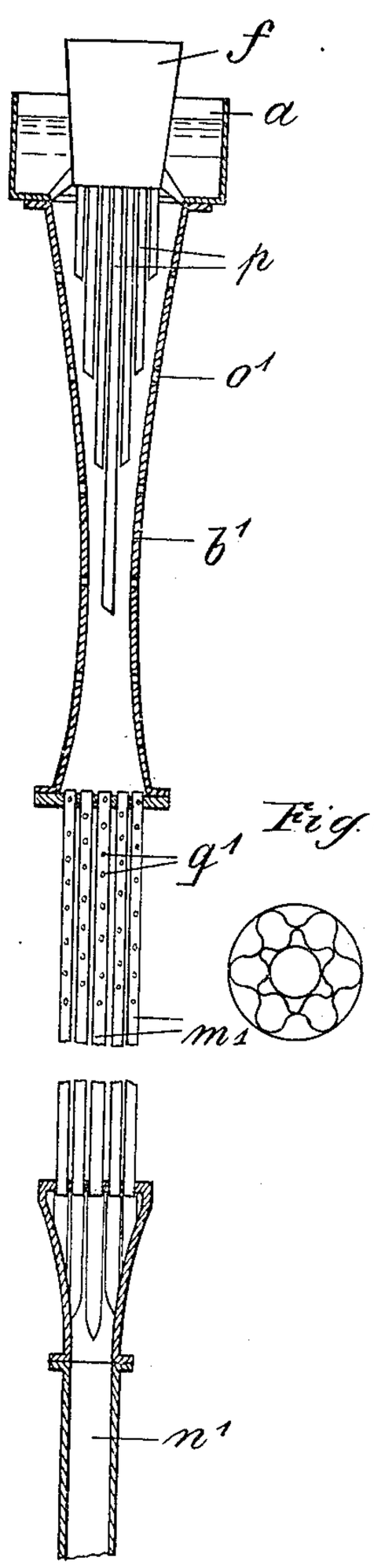

Fig. 4.

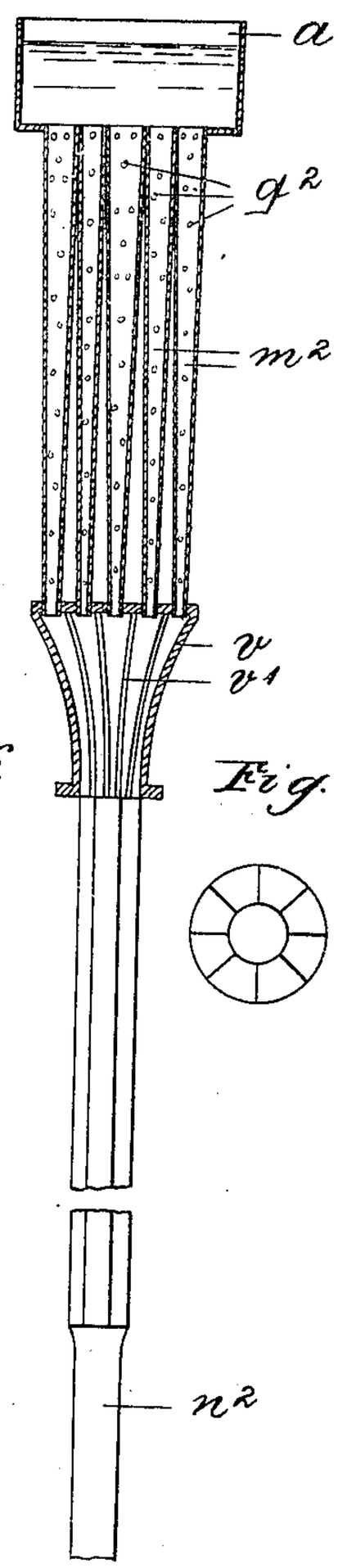

Fig. 5.

Fig. 6.

Fig. 7.

WITNESSES:

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HYDRAULIC AIR-COMPRESSOR.

No. 825,719. Specification of Letters Patent. Patented July 10, 1906.

Application filed April 29, 1902. Serial No. 105,137.

To all whom it may concern:

Be it known that I, MAX FRIEDRICH GUTERMUTH, professor at the Technical High School of Darmstadt, residing at Darmstadt, Gervinusstrasse No. 58, Germany, have invented new and useful Improvements in Hydraulic Compressors, of which the following is a specification.

My invention relates to hydraulic compressors, and has for its principal object to provide a device for the efficient utilization of small bodies of water having a considerable fall.

I have devised a peculiar construction in which air-ports are employed at the part of the apparatus where the pressure is relatively small.

The general features of a hydraulic air-compressor constructed according to my invention will be as follows: At the upper end of the apparatus there are a series of relatively narrow pipes or tubes provided with air-ports at their upper portions, which practically form suction-pipes for the drawing in of air, while their lower portions have imperforate walls and form practically part of the pressure-pipe, which is a pipe of large diameter connected with the lower ends of said tubes.

The details of my invention will be fully described hereinafter and the features of novelty pointed out in the claims.

Reference is to be had to the accompanying drawings, in which—

Figure 1 is a diagram illustrating the principle of my invention and particularly the drawing in of air. Fig. 2 is a longitudinal section of one form of my improvement. Figs. 3 and 4 are longitudinal sections of other forms of my invention. Figs. 5, 6, and 7 are cross-sections showing different forms of tubes for the purpose of my invention.

In Figs. 1 to 4, *a* indicates the flume or race through which the water is supplied and through which it falls with great velocity into the suction-pipe, which in Fig. 1 is designated as *b*. *c* and *d* indicate two particles or small bodies of water which enter the suction-pipe at short intervals. Inasmuch as these two bodies will fall with increased velocity, it follows that the distance between them will gradually increase.

Fig. 1 shows the two bodies at different points of their downward travel and clearly illustrates the increasing distance between them. Of course if the distance between two succeeding bodies of water increases a partial vacuum is formed between such bodies. If, therefore, at proper points air-inlets are provided, a step-by-step suction of air will take place, and according to the increasing distance between such bodies of water air-bubbles of different length will be sucked in and carried downward between the bodies of water. The mixture of air and water will remain in such narrow pipe until the volume of the air has been reduced by compression to the volume of the water or even to a smaller volume, and from that point on the cross-sectional area of the pressure-pipe may be as large as desired.

Fig. 2 illustrates a construction for the purpose of practically carrying out the principle of my invention. The upper end of the suction-pipe *b* is large, as shown, and in addition to the peripheral air-inlets *o* I provide interior air-suction tubes *p*, connected at their upper ends with a shell or vessel *f*, the latter being open to the atmosphere above the level of the water in the race *a*. By this construction I secure a uniform suction of air and the separation of water and air, which is necessary for the further suction period. With the lower end of the pipe *b* I connect a perforated pipe *m*, at the lower end of which the air is compressed to atmospheric pressure, while some air is still drawn in through the perforations *q*. The pressure-pipe *n* forms the downward continuation of the suction-pipes *b m* and is closed to the atmosphere at its outlet—that is, the said pressure-pipe is imperforate and has no openings except its inlet, where it connects with the lower portion *m* of the suction-pipe, and its outlet, where it connects with the apparatus to which compressed air is to be supplied.

In Fig. 3 I have shown a construction which I shall probably prefer to employ in practice. The upper portion *b'* of the suction-pipe is given the particular upwardly and downwardly flaring shape shown, and by means of the peripheral perforations *o'* and interior tubes *p* air and water are distributed evenly, so that the tubes *m'* may receive as far as possible an evenly-distributed amount of the air-and-water mixture. These tubes *m'* may be perforated, as shown at *q'*, to draw in an additional supply of air. The pressure-pipe *n'*, with which the imperforate lower ends of the tubes *m'* are connected, is again made comparatively wide.

In the construction represented in Fig. 4

the single suction-pipe, such as indicated by b and b', Figs. 2 and 3, is omitted, and the water from the race a passes directly into a series of individual suction-tubes m^2, perforated at q^2 and connected at their lower ends with a series of tubes which may be formed by a casing v and partitions v'. These partitions may be disposed in any suitable manner, three different ways of arranging them being shown in Figs. 5, 6, and 7. As the diameter of the series of suction-pipes m^2 is larger than that of the pressure-pipe n^2, the channels formed by the casing v and the partitions v' converge toward their lower ends. These channels being imperforate form pressure-pipes connected with the pressure-pipe n^2 and constituting extensions thereof.

I desire it to be understood that various departures may be made from the forms of construction herein described and shown without departing from the spirit of my invention as here set forth in the accompanying claims.

Now what I claim, and desire to secure by Letters Patent, is the following:

1. A hydraulic compressor comprising a series of suction-pipes provided with air-inlets, and a compression-pipe having at its upper end a series of tubes or channels each connected with one of the suction-pipes, the said tubes or channels converging downwardly, while the lower portion of the compression-pipe is constituted by a single comparatively wide pipe.

2. In a hydraulic compressor, the combination with a series of suction-pipes and pressure-pipes of comparatively narrow diameter connected with said suction-pipes, of a single pipe of large diameter connected with the lower ends of said pressure-pipes.

3. In an apparatus conveying a mixture of water and air at different pressures in the different parts the combination of a series of pipes of comparatively small diameter at that portion of the apparatus where the pressure is relatively small with one pipe of large diameter at the high-pressure end of the apparatus.

4. A hydraulic compressor comprising a relatively wide pressure-pipe and a series of relatively narrow pipes each having its delivery end connected with an air-tight joint to the receiving end of said wide pipe, each pipe of said series having a suction portion provided with air-inlets at different distances from its end and an imperforate pressure portion adjacent to said wide pressure-pipe.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

MAX FRIEDRICH GUTERMUTH.

Witnesses:

RICHARD WIRTH,

FRIEDRICH QUEHL.