G. HAMBRUCH.

Steam and Vacuum Pumps.

No. 196,088. Patented Oct. 16, 1877.

Fig: 1

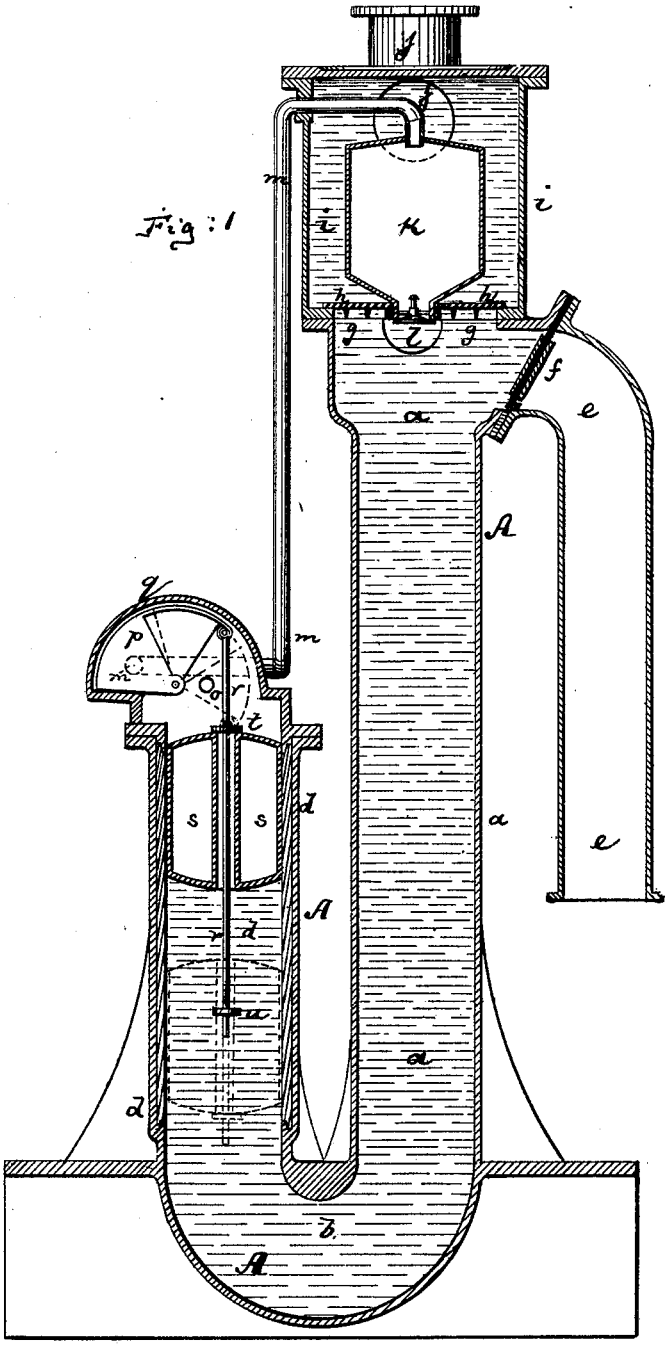
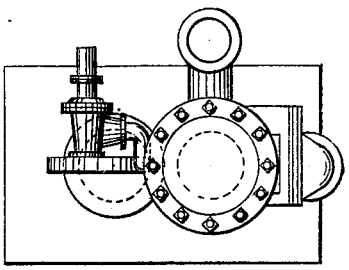


Fig: 2.



Witnesses:

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UNITED STATES PATENT OFFICE.

GUSTAV HAMBRUCH, OF BERLIN, GERMANY.

IMPROVEMENT IN STEAM AND VACUUM PUMPS.

Specification forming part of Letters Patent No. **196,088**, dated October 16, 1877; application filed July 13, 1877.

To all whom it may concern:

Be it known that I, GUSTAV HAMBRUCH, of Berlin, Germany, have invented a new and Improved Steam and Vacuum Pump, of which the following is a specification:

Figure 1 is a vertical central section of my improved steam and vacuum pump. Fig. 2 is a plan or top view of the same.

Similar letters of reference indicate corresponding parts in all the figures.

This invention relates to a new mechanism for raising water by means of a peculiarly-constructed column of water, which, by the condensation of steam, is made capable to effect the operation of lifting water.

The invention consists in the arrangement and combination of parts hereinafter more fully described.

The letter A represents a pipe which is nearly J-shaped, although the appellation is not strictly correct. It has a long upright part, *a*, joined at its lower end, by a bent or other horizontal connection, *b*, to a shorter upright part, *d*, as clearly shown in Fig. 1. This pipe is secured, in the upright position shown, in a suitable frame, which holds it stationary. It is to be made of metal, or may in some cases be made of wood. The larger column *a* is, near its upper end, joined to a pipe, *e*, and between said pipe and the column is a valve, *f*, which opens into the column *a*. The upper end of the column *a* carries a perforated annular plate, *g*, over which a valve, *h*, opening upwardly, is placed. Above this valve is supported, on the column *a*, a vessel, *i*, which is to receive the elevated column of water, which it discharges through a pipe, *j*, that connects to the upper part of said vessel *i*. The vessel *i* contains also the condenser *k*, which is a smaller vessel, having an opening in its bottom, which opening extends through the plate *g*, and is closed by an upwardly-closing valve, *l*. The condenser connects, by a pipe, *m*, with the upper part of the column *d*, into which steam is or may be admitted by a pipe, *o*. The connection between the pipes *m* and *d* can be established and interrupted by a vibratory cup-shaped or other valve, *p*, which is pivoted in a semi-cylindrical box, *q*, that is placed over the shorter column *d* of the main pipe. The valve *p* connects with a rod, *r*, that is suspended into the column *d*. *s* is a float, which is placed into the column *d*, around the rod *r*, and between two shoulders, *t* and *u*, which are formed near the upper and lower ends, respectively, of said rod *r*. The float is to have sufficient play within the column *d* as to be free to move up and down therein. The pipe *d* is throughout its length lined with wood, as indicated.

The operation is as follows: The two columns *a* and *d* and the vessel *i* are filled with water, so that the float *s* is elevated against the shoulder *t*, and the valve *p* thereby put into the position shown in Fig. 1, so as to interrupt communication between the pipes *m* and *d*, but to establish communication between the pipe *o* and the box *q*, and the upper part of the column *d*. The steam which is admitted into the column *d* crowds the water therein contained downward, and also the float *s*. The water that is displaced from the column *d* rises in the column *a*, and passes through the valve *h* into the vessel *i*, and thence off through the pipe *j*.

When the float reaches in its descent the shoulder *u*, it draws the rod *r* down, and swings the valve *p* into its second (dotted) position, to establish communication between the column *d* and the pipe *m*, and interrupt that between the pipes *o* and *d*. This admits the steam from *d* into the condenser *k*, in which it is condensed by contact with the cold walls thereof. At the same time, condensation takes place in the column *d*, and the air therein contained will be rarefied. The atmospheric pressure upon the water leading to the supply-pipe *e* will now cause the water to rise therein, and to pass through the valve *f* into the column *a*, until the column *d* has again been filled with water, when the float *s* strikes the shoulder *t*, moves the valve *p* into the first position, (shown in Fig. 1,) and re-establishes communication between the pipes *o* and *d*. Steam is thereby again shut off from the condenser, and acts upon the water in the column *d*, and forces the same downward, thereby causing it to ascend in the column *a*, and enter the vessel *i* and pipe *j*, as already stated.

It will be observed that by this operation the column in the pipe *a* performs the function of an air-pump, and also serves to keep the con-

denser free of water, as any water of condensation formed in the condenser will be drawn out through the valve *l* as soon as the air in the pipe *d* becomes rarefied.

The suction power of the apparatus depends upon the intensity of the rarefication of the air in the condenser and in the column *d*, and it will, therefore, be necessary or desirable in larger apparatus to provide said condenser with a maximum amount of condensing-surface.

I therefore desire it to be well understood that, as to the form and construction of the condenser, I do not confine myself to any special plan. Thus it may be made with a series of vertical pipes, through which the ascending water can flow while the steam embraces them.

I claim as my invention—

1. The combination of the pipe A, which is constructed of the long and short columns *a d*, with the vessel *i*, pipes *e j*, valves *f g*, condenser *k*, pipes *m o*, vibrating valve *p*, rod *r*, having shoulders *t u*, and float *s*, all constructed to operate substantially as herein shown and described.

2. In combination with the pipe *a* and vessel *i*, the condenser *k* and its downwardly-opening valve *l*, substantially as and for the purpose specified.

This specification signed by me this the 9th day of June, 1877.

GUSTAV HAMBRUCH.

Witnesses:

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