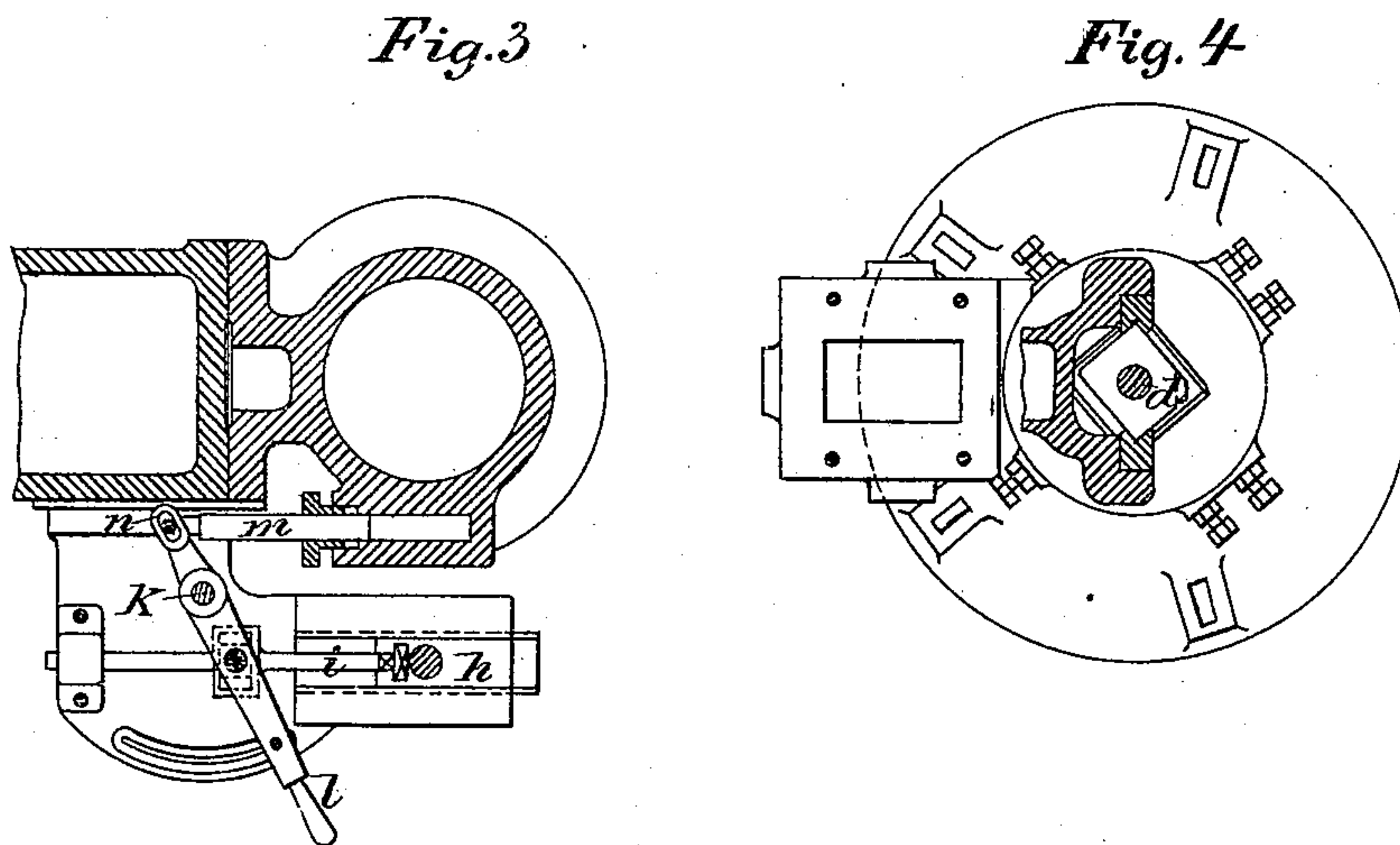
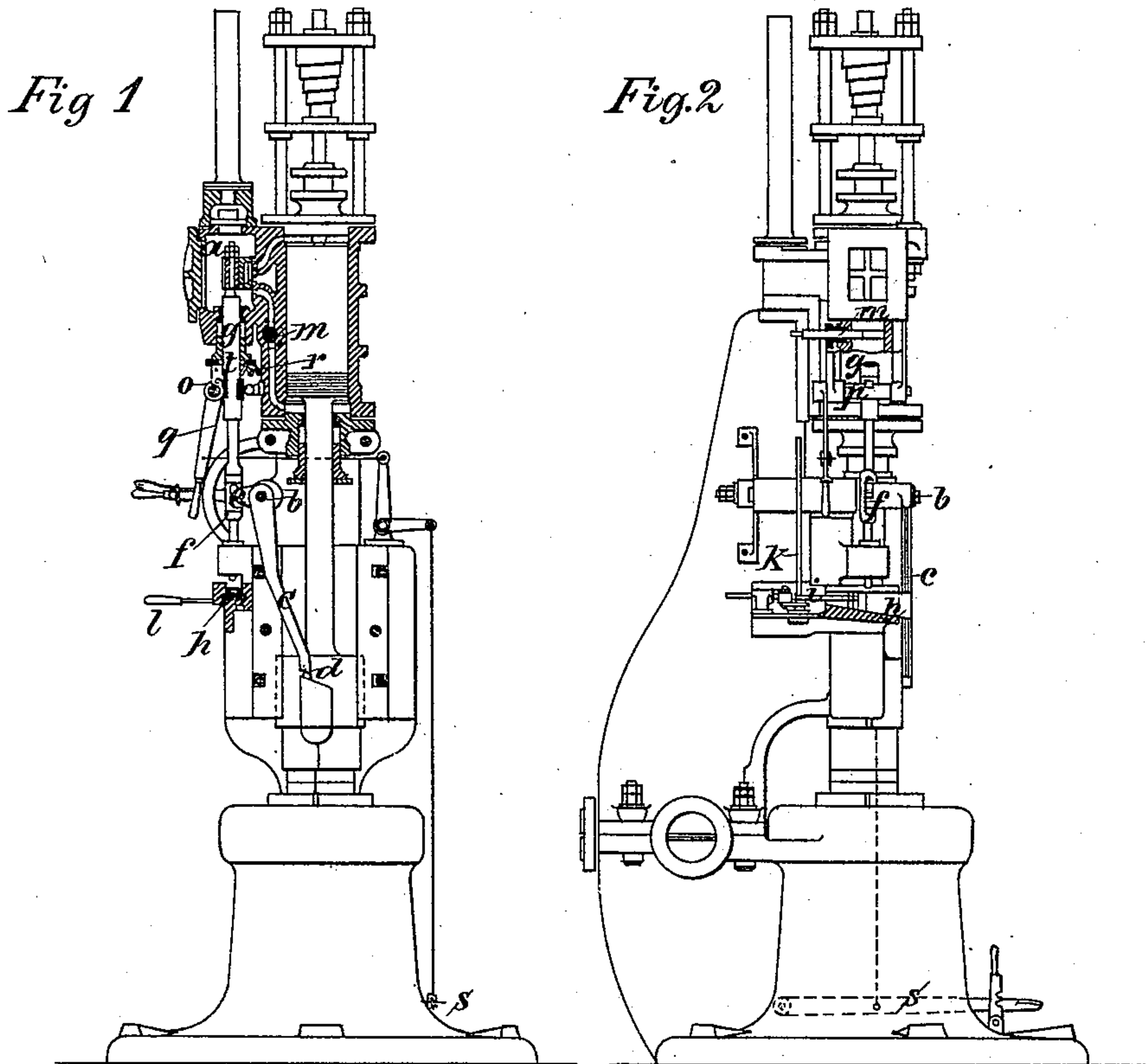


(No Model.)

J. A. HENCKELS.  
STEAM HAMMER.

No. 447,824.

Patented Mar. 10, 1891.



Witnesses:  
Gustave Albert Oelrichs,  
G. Adolf Hardt.

Inventor:  
Johann Albert Henckels.  
G. May Hark  
Attorney



# UNITED STATES PATENT OFFICE.

JOHANN ALBERT HENCKELS, OF SOLINGEN, GERMANY.

## STEAM-HAMMER.

SPECIFICATION forming part of Letters Patent No. 447,824, dated March 10, 1891.

Application filed September 8, 1888. Serial No. 284,968. (No model.) Patented in Germany November 6, 1885, No. 35,606, and in England December 1, 1885, No. 14,774.

*To all whom it may concern:*

Be it known that I, JOHANN ALBERT HENCKELS, manufacturer, a citizen of the Kingdom of Prussia, and a resident of the city of Solingen, Germany, have invented a new and useful Improvement in Steam-Hammers, (for which I have obtained patents in Germany, No. 35,606, dated November 6, 1885, and in England, No. 14,774, dated December 1, 1885,) of which the following is a specification.

Figure 1 shows a vertical section; Fig. 2, a side view of the steam-hammer; Fig. 3, a horizontal section of a detail of the governing-gear; Fig. 4, a section through guides of hammer-head.

The desideratum to construct a steam-hammer applicable as well to all the ordinary forging works and operations as to stamping-works by single blows has led to the improvements in steam-hammers described hereinafter, which caused the inventor to call this steam-hammer the "universal steam-hammer."

A common slide-valve is applied for the distribution of steam on account of it being more steam-tight than pistons or cocks. The slide-valve *a* is moved by a lever *c*, swiveling on an eccentric-bolt. The longer end of this lever rests on a prominence of the hammer-head, while the shorter end *e* of this lever is in connection with an aperture *f* of the slide-valve rod, which is fastened to the slide-valve *a*. The slide-valve rod has in its middle part a plunger or piston *g*, which goes through the under stuffing-box of the slide-valve chest. By arranging this plunger *g* in the manner described the steam inclosed in the slide-valve chest will always have a tendency to move the slide-valve *a*, with the slide-valve rod, downward. The diameter of this plunger *g* has the proper size to overcome the friction of the slide-valve and of the stuffing-box. In consequence the named aperture *f* will always rest on the shorter end *e* of the governing-lever *c*, and the longer end of this lever will for the same reason always rest on the prominence *d* of the hammer-head. For those reasons it is not necessary to let the governing-lever *c* slide in a guide-bar of the hammer-head, which is a great improvement of the invention in comparison with the old con-

structions. The steam-hammer used in this way will work as an ordinary steam-hammer with self-acting motion, with the only difference against the other hammers that the slide-valve *a* is worked by the governing-lever *c* only upward, while the downward motion of the slide-valve is actuated by the steam.

In order to give blows of a various force, a movable wedge *h* is placed on the end of the slide-valve rod. This wedge is connected with a rod *i*, which can be moved by the hand-lever *l*, keyed on the shaft *k*. If the wedge is in its highest position, the end of the slide-valve rod will sooner come in contact with this wedge. Therefore the way of the slide-valve *a* will be very little, and in consequence only very little steam can enter through the upper steam-port. The blow of the hammer will be a light one. If the wedge is in its lowest position, the slide-valve rod will not come in contact with the wedge at all. Therefore the slide-valve will vary its full way and the hammer will give as heavy blows as possible. By giving light blows when only little steam is admitted through the upper steam-port an arrangement is made to diminish at the same time the quantity of steam through the under steam-port and to prevent the piston of the hammer striking against the upper cylinder-cover. To effect this, a plunger *m* is made in the under steam-port and connected to a lever *n*, which is keyed on the shaft *k*. Therefore motion is given to the plunger *m* at the same time with the wedge *h* in such a way that by reducing the quantity of the upper steam the section of the under steam-port is diminished simultaneously.

In order to give at will single blows with the hammer, which is very convenient in ordinary forging operations, but necessary in stamping-works, a contrivance is made to stop the motion of the slide-valve rod as well as that of the slide-valve *a* in a certain position where the hammer-head is in its highest position, and only so little steam enters the under steam-port to keep the hammer-head hanging.

To stop the motion of the slide-valve, a cast-steel pawl *o* is arranged in a shaft lying in bearings in front of the slide-valve rod. On this shaft is keyed a double lever *q*. The up-



per end of this lever is attached to a spiral spring *r*, while the other end, by means of a lever and rod, is connected with a pedestal *s*, which is in reach of the man working the hammer. By the action of the spring *r* the pawl *o* will always be in contact with the cast-steel plate *t*, which is led into the slide-valve rod, and will in consequence arrest the slide-valve.

By treading down the pedestal *s* the pawl *o* will release the cast-steel plate *t* and the slide-valve rod will be free and will be moved downward by the action of steam on the plunger *g*, thus opening the upper steam-port. It is evident that the motion of the hammer will continue as long as the pedestal *s* is kept down. As soon as this pedestal is released the hammer will stop in its highest position.

I claim—

1. The combination, with the valve and its rod, of the movable wedge *h*, the rod *i*, the shaft *k*, and hand-lever *l*, as described. 20

2. The combination, with the valve and its rod, of the plunger *m*, the lever *n* on the shaft *k*, and the wedge, as described. 25

3. The combination, with the slide-valve *a*, of the shaft *p*, steel pawl *o*, double lever *q*, spiral spring *r*, pedestal *s*, slide-valve rod, and steel plate *t*, the whole as described, and for the said purposes. 30

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

JOHANN ALBERT HENCKELS.

Witnesses:

GUSTAVE ALBERT OELRICH,  
G. ADOLF HARDT.