JAMES SULLIVAN.

Improvement in Relief Apparatus for Rolling-Mills.

No. 127,714. Patented June 11, 1872.

Fig. 1

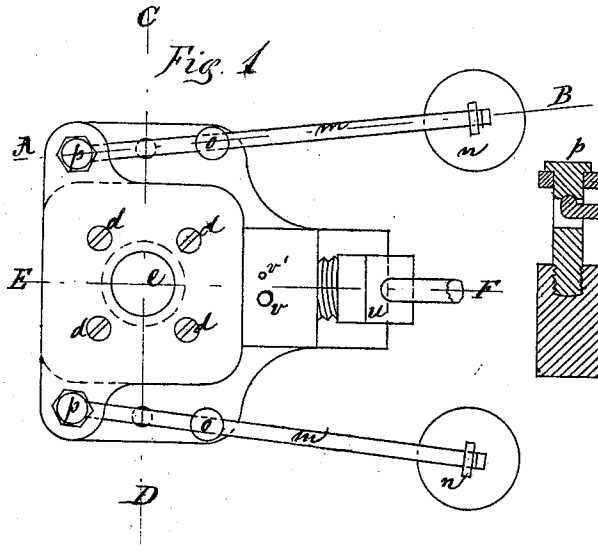


Fig. 2.

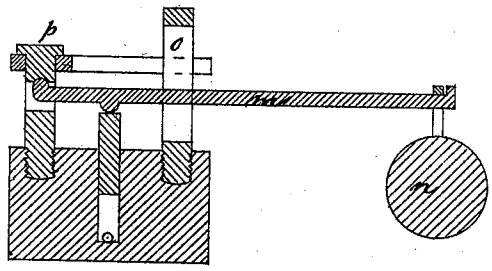


Fig. 3.

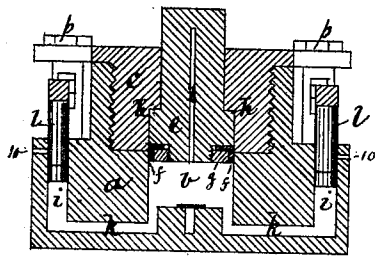


Fig. 4.

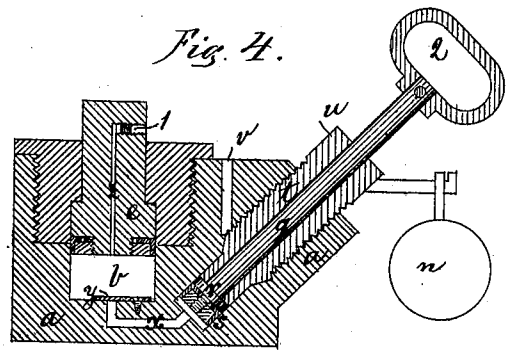
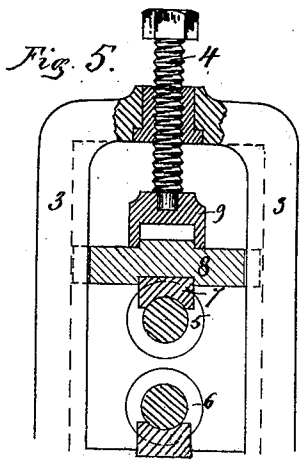


Fig. 5.



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UNITED STATES PATENT OFFICE.

JAMES SULLIVAN, OF BOSTON, MASSACHUSETTS.

IMPROVEMENT IN RELIEF APPARATUS FOR ROLLING-MILLS.

Specification forming part of Letters Patent No. 127,714, dated June 11, 1872.

I, JAMES SULLIVAN, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements on Relief Apparatus for the Rollers on Rolling Machinery for Iron, or other machinery where such a relief apparatus may be serviceable, of which the following is a specification:

Nature and Objects of the Invention.

The nature of my invention relates to improvements on the so-called "breakers" or relief apparatus for the rollers on iron rolling or squeezing machinery or similar machines of a kindred nature; and consists in an apparatus containing a cylinder in which a piston is movable. The cylinder stands, in connection with one or more safety-plugs that are movable, in smaller cylinders, and held down in their positions by levers and weights. The cylinder, as well as the connections with the smaller cylinders, is to be filled with oil or any other suitable liquid, forced under pressure in the apparatus, and the safety or relief plugs are to be weighted in such a manner that they will rise up before the ultimate breaking strain of the rollers is attained, and by this means prevent the rollers from breaking in case a hard piece of iron or too much iron should suddenly be brought in between the rollers or squeezers. This my improved relief apparatus is to be placed under the lower end of the regulating-screw and on the upper side of the saddle-piece that rests on the upper bearings for the roller; or my relief apparatus may be made in one piece with the saddle, and in this manner rest directly on the upper bearings.

I do not confine the use of my improved apparatus to iron rolling or squeezing machinery alone, as it can to the same advantage be used on quartz-mills, stone-breakers, or similar machines where a relief apparatus may be useful.

The apparatus is provided with a force and screw pump, by means of which the liquid can be forced under pressure in the apparatus before it is put to test in the frame of the rolling machinery.

This my improved apparatus is to take the place of the very defective ordinary cast-iron or other breakers now in use on rolling-mills, for which purpose I construct it as follows:

On the drawing, Figure 1 is a ground plan. Fig. 2 is a longitudinal section over the line A B taken on Fig. 1. Fig. 3 is a cross-section over the line C D taken on Fig. 1. Fig. 4 is a central longitudinal section over the line E F, also taken on Fig. 1; and Fig. 5 is a sectional elevation of an ordinary rolling-machinery frame with an ordinary breaker placed therein.

Similar letters refer to similar parts wherever they occur on the different parts of the drawing.

To enable others skilled in the art to make and use my invention, I will now proceed with a description of the construction and operation of the same.

a on the drawing is a block, of iron or suitable metal, provided with a circular chamber or cylinder, *b*, bored therein, as shown. A cap or cover, *c*, is screwed in the block *a*, and furthermore attached to the block *a* by means of the screws *d d d d*. In the cylinder *b* is the piston *e*, movable, and provided at its lower end with an hydraulic packing, consisting in the angular packing-ring *f* and nut *g* screwed over the end of the piston *e*. The piston *e* is provided with an angular collar, *h*, that is made to rest against a recess in the cover *c*. The upper end of the piston *e* projects through a circular opening in the cover *c*. The cylinder *b* stands, in connection with the smaller cylinders *i i*, by means of the channels *k k*, as shown. In the cylinders *i i* are the circular plugs *l l*, provided at their lower ends with similar hydraulic packings, movable up and down tightly. The plugs *l l* are held down, by means of the levers *m m* and weights *n n*, in the same manner as ordinary safety steam-valves are arranged. For this purpose slotted guide-bolts *o o* steady the levers *m m*, and slotted supporting-bolts *p p* support the extreme ends of the levers *m m*, as shown. On one side of the block *a* is arranged a suitable force-pump, Q, for the purpose of forcing the oil or other liquid used in the apparatus when required for service. The said force-pump consists of a pump-rod, *q*, provided on its lower end with a collar, *r*, and suitable hydraulic packing *s*. The pump-rod *q* is guided in a sleeve, *t*, having a screw-thread cut on its outside periphery that screws into a female screw in the block *a*, as shown. The lower end of the screw-sleeve *t* rests against the collar *r*, when it is screwed down in the block *a*, and

the upper end of the sleeve is provided with a suitable-shaped head, *u*—square, hexagon, or otherwise—over which an ordinary wrench can be placed for the purpose of turning the screw *t*. A hole, *v*, is made in the block *a* leading to the pump *q t*, through which the oil or liquid may be poured in the cylinder *b*. A small vent-hole, *v'*, is made close to the supply-hole *v*, for the purpose of letting the air escape from the pump as the liquid is poured in. A small channel, *x*, leads from the pump *q* to the cylinder *b*, which channel is covered by a suitable stop-valve, *y*, placed in the bottom of the cylinder *b*, as shown, whereby the liquid that is once forced in the cylinder *b* cannot escape back again through the channel *x*. A vent-hole, *z*, is made through the piston *e* for the air to pass out from the cylinder *b* when the same is being filled with the liquid. The vent-hole *z* is covered by means of a screw-plug, 1, or similar device, as soon as the cylinder *b* is filled with the liquid.

The manner in which the apparatus is filled with liquid and regulated is as follows: I screw the sleeve *t* out so far that the packing *s* on the pump-rod *q* may be moved beyond the hole *v* and pour the liquid in through said hole *v*, after first having opened the vent-hole *z'* in the piston *e*, and press the liquid in the cylinder *b* by manual power applied directly to the handle 2. During the filling of the apparatus I keep the weights *n n* close up to the guides *o o* on the levers *m m*. When the cylinder *b* is so much filled that the liquid commences to run out through the upper end of the vent-hole *z* I close it by means of the screw-plug 1 and continue to force the liquid in by means of the handle 2, rod *q*, and piston *r s*, till it is impossible to force any further by direct manual power, when I screw the sleeve *u* down and place the weights *n n* in such a place on the levers *m m* that the pressure on the piston *e* will be somewhat less than the ultimate breaking strain of the rollers or other machinery for which my apparatus is to serve as a relief.

In Fig. 5 I have shown an ordinary rolling-machine frame, 3 3, through the upper part of which the pressure or regulating screw 4 is screwed, as shown. 5 is the upper roller, and 6 is the lower one. The neck of the upper roller is provided with a bearing, 7, on the top of which rests the saddle 8, as shown. Between the lower end of the screw 4 and the upper side of the saddle 8 is placed an ordinary "breaker," 9, made of cast-iron, and of such a strength that it ought to break before the ultimate breaking strain of the rollers 5 and 6 is attained; but this kind of a breaker has not been found to be serviceable, and I propose, therefore, to use my improved relief apparatus in place of the ordinary breaker 9, as shown in Fig. 5. I intend, therefore, to place my apparatus on the upper side of the saddle 8, or make it in one piece with the saddle, and screw the under side of the screw 4 against the upper end of the movable piston *e*. After the liquid in the cylinder *b* is compressed and the weights *n n* adjusted so as to rise at a certain pressure, (less than the ultimate breaking strain of the rollers or other machinery,) and the apparatus placed in the position above named, should then such a pressure occur between the rollers on account of a hard or cold piece of iron coming between them, or for other reasons, the piston *e* will be pressed down in the cylinder *b*, and thus communicating the pressure of the liquid contained therein to the safety-plugs *l l*, that will rise upward, and thus for the time being relieve the pressure between the rollers and prevent the breaking of the same. As soon as the sudden pressure is relieved between the rollers, the piston *e*, plugs *l l*, and levers *m m*, with their weights *n n*, will automatically take their original relative positions. Small vent-holes 10 10 are made in the upper ends of the small cylinders *i i*, so as to prevent the plugs *l l* from being forced out from the cylinders *i i*, and also for the purpose of letting the air escape from the cylinders *i i* when filling the same with the liquid that is used.

When the breaking strain of a roller or other part of a machine is known it is easy to calculate the weight and position of the balls *n n*, so that the safety-plugs *l l* may rise before such ultimate breaking strain is attained.

Having thus fully described the nature, construction, and operation of my invention, I wish to secure by Letters Patent, and claim—

A hydrostatic safety apparatus, consisting in the arrangement of the block *a*, cover *c*, cylinder *b*, and piston *e*, and the safety-pistons *l l*, one or more, resting on the liquid, and actuated by means of the levers *m m* and weights *n n*, for the purpose of preventing the breaking of the rollers in rolling-mills or other machinery, as herein fully set forth.

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