2 Sheets—Sheet 1.

E. SUCKOW.

MACHINE FOR SQUEEZING PUDDLERS' BALLS.

No. 190,385. Patented May 1, 1877.

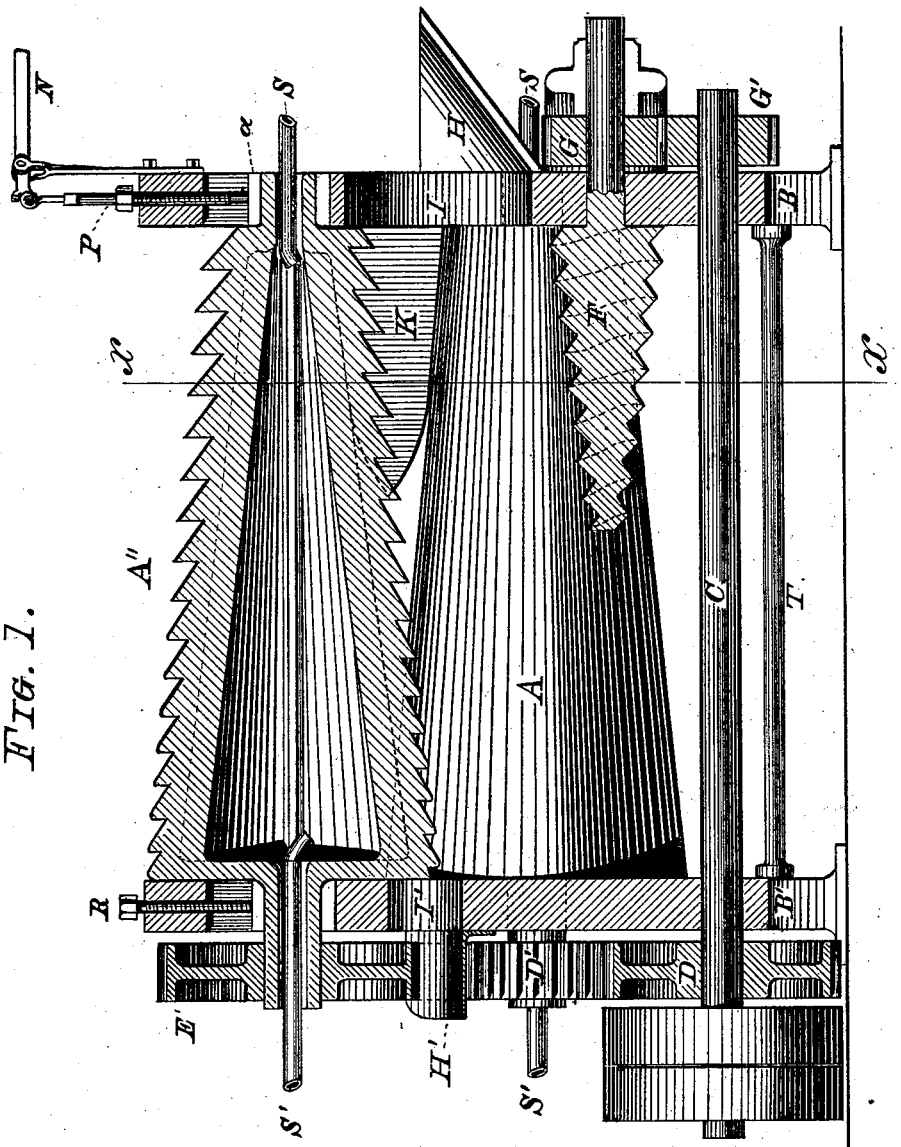

FIG. 1.

WITNESSES.

Frank Hirsch.

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INVENTOR:

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2 Sheets—Sheet 2.

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FIG. 3.

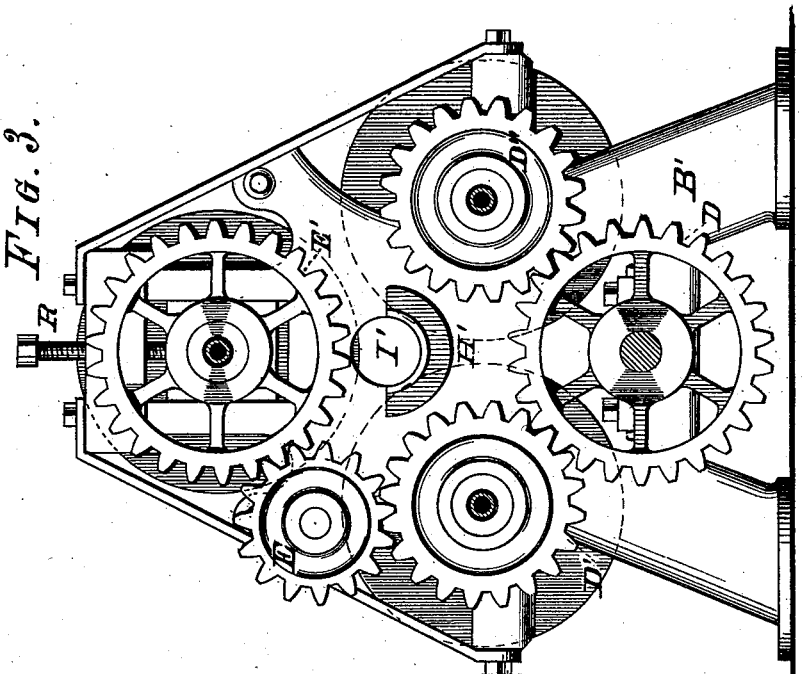
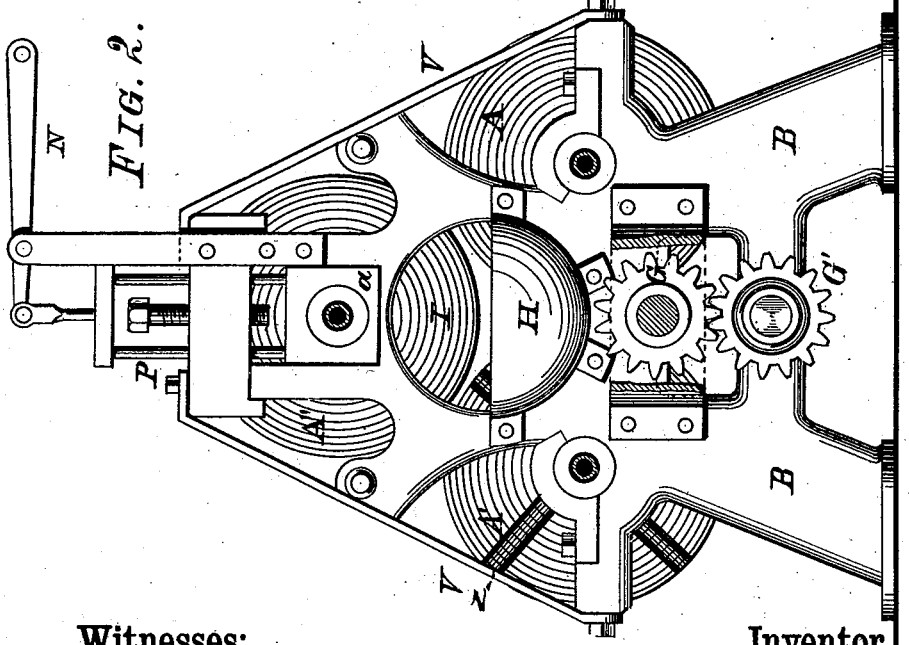


FIG. 2.



Witnesses:

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UNITED STATES PATENT OFFICE.

EDMUND SUCKOW, OF BUFFALO, NEW YORK.

IMPROVEMENT IN MACHINES FOR SQUEEZING PUDDLERS' BALLS.

Specification forming part of Letters Patent No. **190,385**, dated May 1, 1877; application filed February 12, 1877.

To all whom it may concern:

Be it known that I, EDMUND SUCKOW, of Buffalo, in the county of Erie and State of New York, have invented certain new and useful Improvements on Squeezers; and I do hereby declare that the following description of my said invention, taken in connection with the accompanying sheet of drawings, forms a full, clear, and exact specification, which will enable others skilled in the art to which it appertains to make and use the same.

This invention relates generally to puddlers' ball-squeezers; and it consists in the combination, with a suitable frame, of three or more rollers, so arranged that the space bounded by and included between said rollers shall be tapering or decreasing in size, two or more said rollers being provided with spiral projections, whose pitch on each roller shall be varying in relation to that of the remaining rollers, whereby a puddler's ball, introduced into the larger space between said rollers, shall be caused to move forward longitudinally through said space in such manner that said movement will be a compound rotary and rectilinear one at the commencement of the action upon said ball, and as the said ball elongates and assumes the shape of a bloom a rotary and forward movement only, all as hereinafter more fully set forth and described.

In the drawings, Figure 1 is a longitudinal sectional elevation. Fig. 2 is a front, and Fig. 3 a rear, elevation.

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

A A′ A″ are a series of rolls, made of suitable material, which may be hardened by any of the well-known processes, if desired. These rolls are revolved within suitable bearings in a frame composed of two standards, B B′. They are made tapering and hollow, and all, or at least two of them, have on their periphery spiral projections. They are, furthermore, arranged with their axial lines parallel, and with their larger ends opposite each other, so that the space bounded by and included between the adjacent portions of their periphery gradually diminish in size as that of the rolls increase. The two lower rollers, A A′, rotate in fixed bearings placed the proper distance apart, while the upper one is adjustably arranged in sliding boxes *a*, located in the upper part of the standards B B′, and they are rotated from the main shaft C through the main spur-wheel D, intermediate gear-wheel E, and the wheels D′ D″ E′, respectively, the latter three being those secured to said rollers.

By their connection in the manner described the rollers A A′ A″ are all rotated in the same direction.

Below these rollers is located a supplemental roller, F, having an external contour corresponding to that of the former, except that it is shorter than those, and located with its larger end opposite the smaller end thereof. This auxiliary roller is revolved by means of the gear-wheel G from the gear-wheel G′ fixed to the main shaft C, arranged below said roller F, and receives its motion from any prime motor, &c., in the usual manner. Attached to the front standard B is a scoop-like receiver, H, placed to coincide with a corresponding opening, I, in said standard. The rear standard B′ has a similar opening, I′, of less diameter than the former, and likewise a correspondingly-reduced discharge-spout, H′. Between the rollers A and A″ and A′ and A″, respectively, are placed shields K, attached with one end to the front standard B.

The parts heretofore described are all made of suitable material, and of the proper strength requisite in a machine of this kind. In operation the action of the same is as follows:

The puddlers' ball, as it comes from the furnace, is placed into the receiver H, from whence it will roll between the rollers, and there travel toward the rear end of the rollers, whereby it is compressed and squeezed, in a manner as hereinafter described, between the adjacent portions of the periphery of the three rollers A A′ A″, in conjunction with the spiral projections thereon.

In this passage of said ball it is caused to revolve in a direction with the said rollers, and, in the commencement of the action of the same, in a direction at right angles thereto, which movement results in a compound rotary motion of said ball. This result is produced by the helical projections of one or more of said rollers differing in pitch from those of the remaining rollers, or by revolving the

same faster, or by a combination of both varying pitch and accelerated speed. In this manner the ball is first perfectly squeezed from all sides and afterward compressed and stretched, and it emerges from the delivery end of the machine through the opening I′ in a perfect condition as a round muck-bar.

It will be observed that the rollers are made tapering, and have their axial lines all parallel. This may be varied by making the rollers parallel and their axial lines converging, which would produce the same result of making the space between the adjacent portions of the rollers tapering, and would, therefore, be a mechanical equivalent of the arrangement heretofore described.

The revolution of the ball in a direction with that of the rollers is caused by frictional contact therewith, in combination with the notches *z* in the spirals, the forward movement thereof by the spiral projections, and the revolution at right angles to the plane of the rollers by the varying pitch of said spirals. It is therefore evident that, for simply revolving the ball in a direction with the rollers, plain or longitudinally-grooved rollers would answer this purpose perfectly well; but to insure the compound forward movement and rotary motion, at least one of the rollers should be spirally grooved; and to produce the compound rotary and rectilinear motion, two rollers, at least, must be spirally grooved, and one of these must have spirals of greater pitch than the remaining one. For this reason it is obvious that, while all the rollers may be spirally grooved, it is not absolutely necessary that they should be so constructed, but that one may be a plain or longitudinally grooved, and the remaining two spirally grooved, and their pitch made to vary in any one of the manners hereinbefore described. It is furthermore obvious that the diameters of the rollers may be varying without interfering with their action.

In order to deeply indent the ball when first introduced, and in a nearly liquid state, and to knead the same thoroughly, and also to assist in the revolving of the ball, and to prevent it from separating on account of the shifting action of the spirals, these are made of **V** shape, with their forward or leading side very steep, or nearly at right angles to the plane of the rollers, and on the forward end very high, so as to embed themselves sufficiently into the pliable mass of iron to insure its being properly worked. For this reason, also, one of the rollers is provided with scores or notches in the spirals, as shown in Fig. 2, into which the soft metal forces its way, forming, as it were, projections, which act, in conjunction with said scores or depressions, in a manner similar to that of cog-wheels, thereby aiding in revolving said ball; but since the ball while advancing becomes more solidified, and therefore capable of better withstanding such action, these scores or notches, as well as the spirals, are made shallower and closer together, so as not to feed the bloom too fast, and not to leave marks therein when it leaves the machine.

To compel parts of the ball detached during the squeezing and kneading process—should such take place notwithstanding the precautionary measures taken in the peculiar construction and shape of the spirals—to reunite, I have located the lower roller F in its indicated position, to prevent the detached parts from falling through, and thereby enabling them to attach themselves again to the bulk of iron, which, at that stage of the process, is still at a welding-heat, and also to assist in the revolution of the ball, while the sides between the middle and upper rollers are protected by shields K to prevent their escape through the space covered by these shields.

To enable the proper "criping" of the rollers on varying sized balls, I have made the upper one self-adjusting by means of the sliding boxes *a* in said frame. The forward end of this roller is allowed to rise and fall freely, and of its own accord, so as to adapt itself to the varying contour of the ball, a lever, N, and connecting-rods P being provided to lift that end for a free introduction of the ball. But the rear end of this roller should, preferably, be adjusted by means of the screw R, so as to produce muck-bars of uniform diameter, the difference in size of the balls evidencing itself in their length.

To keep the rollers cool during operation, I make them hollow, and introduce a current of water through the trunnions or bearings thereof by means of the pipes S. To strengthen them they are internally provided with radial ribs, as shown in Fig. 1.

Instead of the connecting-gearing an endless chain may be employed to revolve the rollers.

The position in which the machine is operated is that wherein the axes of the rollers are horizontal; but it may also be operated in any other position.

It is obvious that the frames B B′ must be properly braced by the tie-rods T, as shown in Fig. 2, and additionally strengthened by bands V, made of wrought-iron, and properly secured to said standards.

Having thus fully described my invention, I claim—

1. As an improvement in the process of squeezing puddlers' balls, the application of pressure, and simultaneous compound rotary and rectilinear motion to the ball by the action of rollers having peripheral spiral grooves or ribs, arranged substantially as described.

2. The standards B B′, having the bearings for the rollers, and in combination therewith a series of rollers provided with spiral projections, and arranged to revolve all in the same direction for operating upon a puddler's ball, in the manner and for the use and purpose stated.

3. The combination, with the rollers A A′,

of the auxiliary roller E, arranged below said rollers, substantially as stated.

4. The combination, with the roller A″, of the sliding bearing *a*, the forward one being arranged with capability of automatic and independent adjustment, as described, for the object stated.

5. The combination, with the rollers A A′, of the shields K, as described.

6. An improved puddlers' ball-squeezer, consisting, essentially, of rollers, combined substantially as described, and designed to operate, as stated, in virtue of the arrangement of them and their peripheral V-shaped spiral grooves or ribs.

7. An improved puddlers' ball-squeezer, consisting, essentially, of rollers, combined substantially as described, and designed to operate as stated, in virtue of the arrangement of them and of their peripheral spiral ribs or projections, the leading sides of which are at, or nearly at, right angles to the axis of the rollers.

8. An improved puddlers' ball-squeezer, consisting, essentially, of rollers, combined substantially as described, and designed to operate, as stated, in virtue of the arrangement of them and their peripheral spiral ribs or projections of varying depth, as set forth.

9. An improved puddlers' ball-squeezer, consisting, essentially, of rollers, combined substantially as described, and designed to operate, as stated, in virtue of the arrangement of them and their spiral ribs or projections of varying pitch, as set forth.

10. An improved puddlers' ball-squeezer, consisting of a combination of spirally-ribbed rollers, the ribs of each varying in pitch from those of the other rollers, substantially as described.

11. An improved puddlers' ball-squeezer, consisting, essentially, of rollers, combined substantially as described, and designed to operate, as stated, in virtue of the arrangement of them and their scored or notched spiral ribs or projections, as set forth.

In testimony that I claim the foregoing as my invention I have hereto set my hand and affixed my seal in the presence of two subscribing witnesses.

EDMUND SUCKOW. [L. S.]

Attest:

MICHAEL J. STARK,

WM. A. TRALLES.