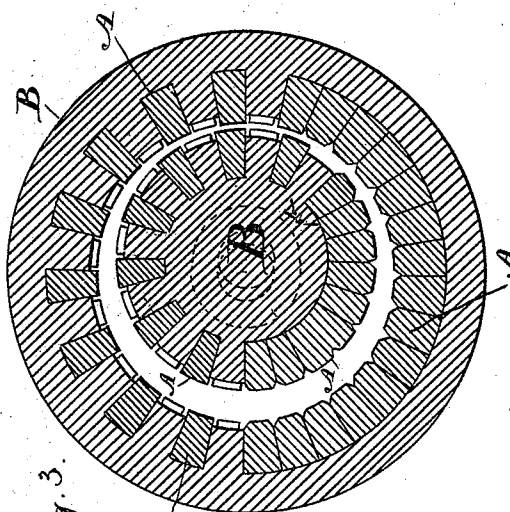
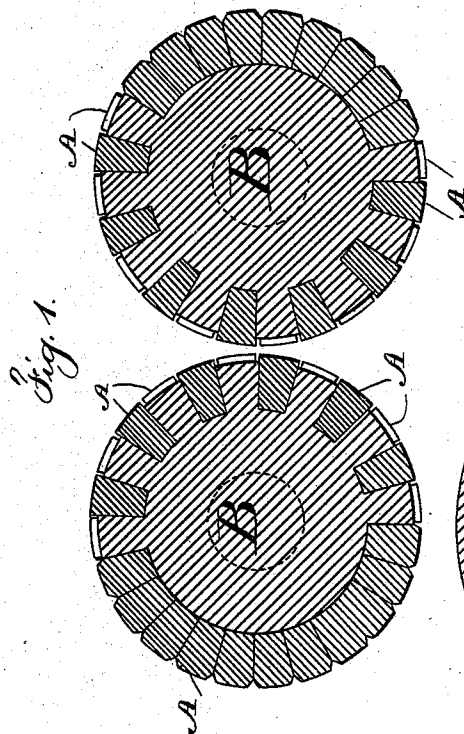
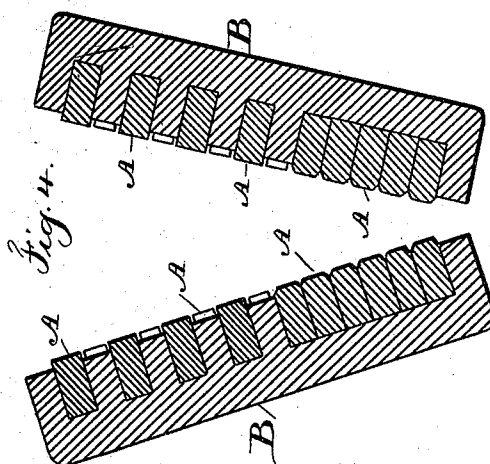
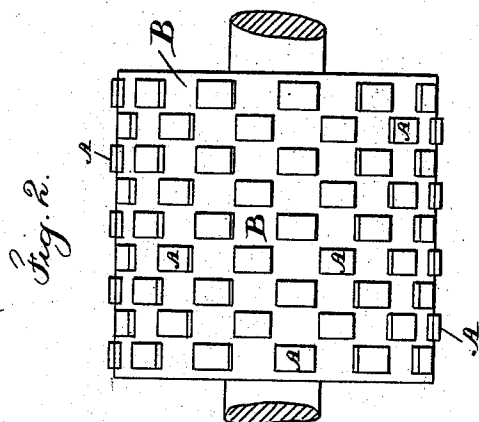


(No Model.)

A. P. STEPHENS.
SURFACE FOR GRINDING AND CRUSHING.

No. 412,558.

Patented Oct. 8, 1889.



Witnesses
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UNITED STATES PATENT OFFICE.

ANSON P. STEPHENS, OF NEW BRUNSWICK, NEW JERSEY.

SURFACE FOR GRINDING AND CRUSHING.

SPECIFICATION forming part of Letters Patent No. 412,558, dated October 8, 1889.

Application filed February 18, 1889. Serial No. 300,281. (No model.)

To all whom it may concern:

Be it known that I, ANSON P. STEPHENS, of New Brunswick, in the county of Middlesex and State of New Jersey, have invented an Improvement in Surfaces for Grinding and Crushing, of which the following is a specification.

Rolls for crushing stone and other materials have been made of cast-iron and also of steel; but in practice the surfaces are liable to become grooved circumferentially in consequence of the ore or other hard substance not being cracked, but remaining between the rolls, or such surfaces wear away unevenly in consequence of blow-holes and soft places in the metal, and in cases where the rolls are adapted to catch and crush the mineral substances such mineral substances are liable to become pulverized too finely and the surfaces of the rolls or other grinding or cracking device, being of uniform hardness, do not offer angles or offsets for catching and cracking the stone or other material, and in cases where the surfaces have been corrugated or roughened the corrugations will wear off rapidly and cease to be useful.

I make my crushing or grinding rolls of alternate hard and soft materials in order that the softer portions of the material will wear away the most rapidly and leave the harder portions of the surfaces projecting to form knobs or protuberances that catch and crack the stone or other material between the two surfaces of the rolls.

In the drawings, Figure 1 is a section of a pair of crushing-rolls. Fig. 2 is a side elevation of one of the crushing-rolls. Fig. 3 is a sectional plan representing my improvement as adapted to a crushing-nut and surrounding conical receptacle, and Fig. 4 is a vertical section of crusher-jaws with my improvement.

I make use of a body B of cast metal—such as cast-iron alone or with any suitable alloying metal and blocks or pieces A of steel or similar material—against or around which the iron of the body B is cast. It is preferable to make the blocks or pieces A of the proper size and shape and then to set them into the mold into which the metal is cast, so that such cast metal may run against or around the block, which may have been previously heated, and

such metal should be sufficiently hot to fuse and unite with the surfaces of the steel blocks, thereby holding such blocks firmly into the cast metal, and in effecting this the melted metal in a highly-heated condition may be run through the mold and overflow until the blocks become sufficiently heated.

According to the object for which the grinding or crushing rolls are made, so the blocks or pieces A may be closer together or farther apart, and in some portions of the rolls shown I have represented the steel blocks as coming close together, it being understood that in use the edges of the blocks A will be worn away most rapidly, so as to form slight grooves or recesses between one block and the next for catching and cracking the ore or other material operated upon.

In the manufacture of these crushing or grinding rolls the casting may be allowed to cool slowly, so that the steel blocks A will be in a soft condition adapted to being turned, ground, or otherwise rendered sufficiently true for the purposes intended, after which the roll may be heated and the steel hardened or tempered to any desired extent.

It is usually preferable to consolidate the steel made use of for the blocks or pieces A by rolling or forging the same to render such steel more uniform in density and hardness, and when the surfaces of the rolls are made true and smooth before being used the cast-iron portions will wear away with sufficient rapidity to allow the steel pieces to project sufficiently for rendering the cracking or grinding operation the most efficient.

In cases where blocks or pieces of steel have been held within a cast-iron backing to form a stamp-head, such steel pieces have not been set closely together to form the active surface, and this cannot be effectively employed unless the steel pieces are melted at their inner end, so as to fuse with the cast-iron.

I do not claim stamp-heads in which the cast-iron receives and holds the steel faces or pieces of steel, as these have been used; but in reciprocating jaws or stamps the action is different to rolls, because in rolls the surface is liable to wear into deep or wide peripheral grooves or channels. This is prevented by my improvement, wherein the projections on the rolls catch and crush hard substances that

would otherwise cut peripheral channels as the rolls rotate in contact with such hard substances.

I claim as my invention—

- 5 1. The grinding-rolls for crushing or grinding ore and hard substances, composed of pieces of steel or similar hard metal in juxtaposition with each other, and united with a body of cast metal to prevent the formation
10 of peripheral grooves, substantially as set forth.

2. The grinding-surface for crushing or

grinding apparatus, composed of pieces of steel set closely together and held firmly in place by the inner surfaces being fused with and 15 by the cast-iron in contact with them, substantially as specified.

Signed by me this 14th day of February, 1889.

ANSON P. STEPHENS.

Witnesses:

GEO. T. PINCKNEY,
WILLIAM G. MOTT.