



US 20240054417A1

(19) **United States**

(12) **Patent Application Publication**
Walker et al.

(10) **Pub. No.: US 2024/0054417 A1**

(43) **Pub. Date: Feb. 15, 2024**

(54) **METHODS AND SYSTEMS FOR
DEPLOYING EQUIPMENT REQUIRED TO
MEET DEFINED PRODUCTION TARGETS**

Publication Classification

(51) **Int. Cl.**

G06Q 10/0631 (2006.01)

G06Q 10/0635 (2006.01)

(52) **U.S. Cl.**

CPC ... G06Q 10/06313 (2013.01); **G06Q 10/0635**
(2013.01); **G06Q 10/06315** (2013.01); **G06N**
7/01 (2023.01)

(71) Applicant: **Freeport-McMoRan Inc.**, Phoenix, AZ
(US)

(72) Inventors: **Mary Amelia Walker**, Phoenix, AZ
(US); **Nicholas Hickson**, Phoenix, AZ
(US); **Robert Catron**, Phoenix, AZ
(US); **Brian Vaughan**, St. Louis, MO
(US); **Hung Jung Lu**, St. Louis, MO
(US)

(21) Appl. No.: **18/380,836**

(22) Filed: **Oct. 17, 2023**

Related U.S. Application Data

(60) Continuation of application No. 17/545,276, filed on
Dec. 8, 2021, now Pat. No. 11,836,659, which is a
division of application No. 17/202,655, filed on Mar.
16, 2021, now Pat. No. 11,244,262.

(60) Provisional application No. 62/990,515, filed on Mar.
17, 2020.

(57) **ABSTRACT**

Methods of deploying shovels and haul trucks to meet a defined production target may include: Determining at least one production constraint for a shovel and a material processing system; estimating an effect of entropy on a cycle time of the haul trucks to produce a future cycle time estimate; estimating an effect of entropy on a material processing time of the material processing system to produce a future material processing time estimate; predicting whether a delay will occur during the operation of the shovel, the haul trucks, and the material processing system; estimating a duration of the predicted delay; determining a number of shovels and a number of haul trucks required to meet the defined production target based on the determined production constraint, the future cycle time estimate, the future material processing time estimate, and the duration of the predicted delay; and deploying the determined number of shovels and the determined number of haul trucks.

